THE AMERICAN GAS LIGHT JOURNAL

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME XCII., No. 17. Whole No. 1,820. | NEW YORK, MONDAY, APRIL 25, 1910. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. H. WADELTON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 42 Pine Street, New York City.

Telephone.—2906 John.

Terms of Subscription, Including Postage.—For the United States, $3; Canada, $4 per annum. European countries, $5 (£1—25 francs).

Remittances should be made either by post office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

Collections are invariably made directly from this office for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

CONTENTS.

An Asterisk (*) Denotes an Illustrated Article.

OFFICIAL NOTICES—

Third Annual Convention, Canadian Gas Association..... 769

Fifth Annual Meeting, Natural Gas Association of America..... 769

Wisconsin Gas Association, Change in Secretary..... 769

Sixth Annual Convention, Southwestern Electrical and Gas Association..... 769

EDITORIALS—

Briefly Told..... 770

The Final Session of the Pennsylvania Gas Association—Current Mention.

Minute to the Memory of Mr. Albert M. Smith..... 770

*A Model Store Building for Displaying Gas Goods, by Mr. C. W. Hare..... 771

Fortieth Annual Meeting, New England Association of Gas Engineers—Concluded from page 732..... 772

Second Day, Morning Session—Discussion on the Wing Paper, Concluded—Fraternal Greetings—Adjourned.

*Table Lights, Communicated by "R."..... 776

Report of Proceedings, Fourth Annual Meeting, American Gas Institute—Concluded from page 736..... 777

Second Day, Afternoon Session—The Acceptance and Interpretation of Data—A Booster System, by Mr. Frank Hellen—Resuming the Joint Session—Report of Committee on Next Place of Meeting—A Resolution—Report of Committee on President's Address—Naming of General Committees—Vote of Thanks—Adjourned—*Wrinkles Prepared for the Fourth Annual Meeting of the Institute, by F. L. Cross, Editor.

Method for Keeping Accounts of Small Gas Concerns, by Mr. F. Lincoln Hutchins—Concluded from page 725..... 801

*A Comparative Investigation of Oiling Methods, Oils and Diaphragms for Meters, by Mr. R. B. Acker and C. C. Hotchkiss..... 803

A Few "Do's" and "Dont's" for Small Coal Gas Works, by Mr. H. L. Rice..... 806

Rates for Industrial Purposes, by Mr. S. E. Wolff..... 807

Recent Patent Issues..... 809

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 809

Contract for the Cruse-Kemper Company—Good Work by Mr. Boyle—The South Shore (L. I.) Gas Company—Proposing Consolidation, Millville (N. J.) Gas District—Death of Mr. John Connors—Contracts for the Gas Machinery Company—The Plymouth County (Mass.) Gas Company—To Light Green Island—Annual Meeting, Newton, N. J.—To Retire Bonds—Death of Mrs. A. T. Rand—Proposed Company for Dallastown, Pa.—Doherty Improved Equipment for Spokane Falls, Wash.—New Foundries for the E. P. Morris Company—General Manager Hewitt is on the Job—Death of Mr. Gardner Morse—A Benefit Association—The Myers Gas Generator Company—The Gas Engineering Company Completes a Contract—Nonsuited—Consolidation at Wilkes-Barre, Pa.—Banquet for Commercial Club, Boston, Mass. Gas Plant for Sea Isle City, N. J.—Minneapolis Gas is Well Above the Standard.

The Market for Gas Securities..... 811

Public Lighting Tables for May, 1910..... 822

[OFFICIAL NOTICE.]

Third Annual Convention, Canadian Gas Association.

CANADIAN GAS ASSOCIATION,
OFFICE OF THE TREASURER,
WOODSTOCK, CANADA, April 19, 1910.

The Third Annual Convention of the Canadian Gas Association, and the first gas show ever held in Canada, will be held in Alexandria Rink, Hamilton, Ont., June 6th to 11th, inclusive. The Canadian Gas Association indorses to the fullest measure the exhibition.

Yours truly, A. W. MOORE, Secretary.

[OFFICIAL NOTICE.]

Fifth Annual Meeting, Natural Gas Association.

NATURAL GAS ASSOCIATION OF AMERICA,
OFFICE OF THE SECRETARY,
DELAWARE, O., April 19, 1910.

The Fifth Annual Meeting of the Natural Gas Association of America will be held in Oklahoma City, Okla., May 17, 18 and 19, under the direction of Mr. Wm. Hunter McKenzie. The Lee-Huckins Hotel has been selected as headquarters and every indication is for a successful meeting. The programme will be given later.

Yours truly, THOMAS CLIVE JONES, Secretary.

[OFFICIAL NOTICE.]

Wisconsin Gas Association. Change in Secretary.

WISCONSIN GAS ASSOCIATION,
OFFICE OF THE SECRETARY,
MILWAUKEE, WIS., April 15, 1910.

Owing to Mr. Hyde's removal from the State, he has resigned the office of Secretary and Treasurer of the Wisconsin Gas Association; and, in order to facilitate the prompt handling of the correspondence of our Association, I would ask that you address communication, relative to Wisconsin Gas Association matters to the undersigned, at No. 192 Wisconsin street, Milwaukee. Yours truly,

HENRY HARMAN, Acting Secretary.

[OFFICIAL NOTICE.]

Southwestern Electrical and Gas Association.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION,
OFFICE OF SECRETARY,
DALLAS, TEX., Feb. 28, 1910.

The 6th annual convention of the Southwestern Electrical and Gas Association will be held in Beaumont, Tex., on May 12, 13 and 14, 1910. A feature of this meeting will be an exhibition of gas and electrical appliances and devices of all sorts. Elegant and roomy quarters for the display have been arranged for in the storeroom of the Kyle theater building. The matter is in charge of Messrs. M. T. Walker, Wm. Carroll, E. M. Weiss and J. C. Moss, Jr. The address of Mr. Wells, who is in charge of the renting of space, is Beaumont, Tex.

D. G. FISHER, Asst. Secretary.

LIBRARY OF CONGRESS, APR 25 1910

BRIEFLY TOLD.

THE FINAL SESSION OF THE PENNSYLVANIA GAS ASSOCIATION.—Completing our summary of the Easton Meeting of the Pennsylvania Gas Association, the first two days of which were reported last week by our special correspondent, the record for the final day being about as this: The final session was opened promptly at 10 A.M. of the 15th inst., the Chairman insisting on the necessity for promptness, so that the programme, including the visit to the Ingersoll-Rand Drill Works, set down for the afternoon, should not be slighted. The first paper considered was that by Mr. J. H. Keppleman, of Reading, Pa., who in clever way recited his experience with "Gas Arcs: Style of Lamp, Installation and Maintenance." Naturally, this matter brought out a very interesting discussion, quite an entertaining chapter to which was contributed by Mr. Cressson. Then came the paper by Mr. John A. Frick, of Allentown, Pa., whose narrative consisted of the recital of an "Experience with Measuring Devices for Air, Steam and Temperature as Applied to Water Gas Apparatus." Evidently the author's tryings with these devices were not altogether satisfactory, but that there was a fair place for them in a gas plant was also not to be denied. Mr. L. R. Dutton's rendering of "Short Topics," which included Chapters on "Office Forms and Help," and the best method of "Maintaining Constant Candle Power During the Year," elicited an animated debate. The final number was the recital, by Mr. L. S. Williams, of Harrisburg, of "Motor Cycle and Automobile Experiences," which dwelt right cleverly with the current day practice of calling into use these methods of propulsion without stint in the work of a gas plant. Indeed, the employing of vehicles of this type, even in the smallest works, will soon be as common as the use of a wheelbarrow was 20 years ago. Not that we mean to say the greater number of such vehicles will be of the highly finished Limousine type; nor will such type be necessary. The Committee on President's address reported in a manner showing that their examination of the document was far more than perfunctory. It was then determined that a Question-Box should figure in the technical doings of the future, and it was also determined to have a distinctive button designed for the Pennsylvania. The immediate adjournment was preceded by the ringing adoption of votes of thanks to the officers, to the Easton Company and to the people of the city for cause. Later on the Association and its guests were photographed, the group having been suitably arranged along and on the steps of Heptasoph Hall. The visit to the Ingersoll-Rand Company's mammoth plant was shared by at least 90 per cent. of those who attended the sessions, and it brought to a fitting close a meeting that was eminently successful from every point of view.

CURRENT MENTION—

THE semi-annual meeting of the American Society of Heating and Ventilating Engineers will be held in St. Louis, Mo., on Thursday, June 30, and Friday, July 1st. All advance communications in reference to the meeting should be sent to W. M. Mackay, P.O. Box 1818, New York.

WE are indebted to the H. Mueller Mfg. Co., of Decatur, Ills., for a copy of its latest booklet, which bears the title of "Summer's Comin'." It properly has to deal with matters and materials that have to do with piping and the laying thereof. Now is the time when the distribution divisions of the companies are overrun with demands for mains, services and the like, and the sheets of "Summer's Comin'" may be found quite handy, in that they clearly list a line of tools that will be constantly in use by the main gangs, until knocking-off time next October is reached.

To show how good management and persistent canvassing achieve results it is illustrative to note that, according to figures printed in the Boston papers for the 21st inst., the combined net earnings available for dividends by the subsidiary corporations in the Massachusetts Gas Companies for March last were $212,075, an increase of $29,285 (15.94 per cent.), compared with the corresponding month last twelvemonth. The February earnings increased $17,409 or 9.05 per cent.; and the net earnings available for dividends in the 9 months ended the 31st ult., total $1,602,621, compared with $1,393,806 in 1909.

MESSRS. W. E. MORRISON & CO., of Detroit, have purchased the gas plant at Grand Haven, Mich., from its former operators, Messrs. Monroe and Loutit. The new owners will make notable extensions to the works.

THE April meeting (14th inst.) of the Chicago Section of the Illuminating Engineering Society was held in the rooms of the Western Society of Engineers, 98 Jackson Boulevard. The sessions were of a noteworthy character, and several plans were submitted in response to the notification that plans for the lighting of a small store and its show windows would be received. Elevation plans in respect of the particular premises to be lighted had been mailed to the members well in advance of the meeting. Secretary Beebe seems to have a lot of "go" in his make-up.

ON the recommendation of Mr. Henry L. Lea, who was retained by the Company to advise it, the proprietors of the Kirksville (Mo.) Gas Company will install a water gas equipment, also a storage holder. These additions will practically double the present capacity of the plant.

THAT well-loved member of the Old Guard of gas engineers, Mr. Isaac Battin, retires from active service with the Omaha (Neb.) Gas Company on the 1st prox. He has been granted indefinite leave of absence, but has the full consent of the Company to retain his titles of Treasurer and Engineer. He became connected with the Omaha Company in 1887, going there from the Albany (N. Y.) Company, which concern he faithfully and well served for close to 25 years. His earliest service was with the Manhattan Company, of New York, then to Middletown, Conn., and Yonkers, N. Y. Altogether he has been in the ranks since 1855, and in that more than half a century of active work his record is that of a man who was always on the job. In company with his ever faithful, always charming helpmeet, he will pass the evening of his life in Philadelphia. If we mistake not, he is a grand-nephew of the Battin who was the senior member of the one time renowned firm of gas works builders, Messrs. Battin & Dongan, of Albany, N. Y.

Minute to the Memory of Mr. Albert M. Smith.

We are indebted to the courtesy of the Society of Gas Lighting for its consent to our publishing the minute passed to the memory of Mr. Albert M. Smith, at a meeting specially convened for the purpose:

The members of the Society of Gas Lighting having learned with sorrow of the death of their fellow member,

MR. ALBERT M. SMITH,

which occurred Feb. 27th, 1910, and wishing to place on record some appreciation of him as a friend and associate, this minute is prepared.

Mr. Smith was one of the original members of this Society and, since its organization, he has been one of the most regular and constant attendants at the meetings; and it can be fairly said that he added much to the usefulness and pleasure of these meetings by his presence. His long experience in our business, added to his good judgment, made his statements and suggestions of great value and, combined with this, was an unfailing courtesy in a pleasant, genial manner that made him most welcome at any gathering, particularly amongst those who knew him so well and liked him so much as the members of this Society.

Mr. Smith had an exceptionally long and varied experience in the gas business. Starting as a boy with the old Manhattan Company he rose, by his industry and ability, through various positions to that of Chief Engineer; and afterwards, with its successor, the Consolidated, he occupied various prominent and responsible positions. His services with these two companies, with the exception of the period when he was in the army during the Civil War, was continuous and covered a period of nearly 57 years—a record rarely, if ever, equalled.

In spite of his occupying these high positions, which made him one of the prominent figures in the gas business, he was modest and retiring; but those who knew him well realized his great ability. One of his pleasantest qualities was the willingness with which he gave advice when asked, particularly to young men, to whom he thought he might be of material assistance.

To our members the death of Mr. Smith is a great loss. Most of us had known him for many years, and we not only respected him, but had an affectionate regard for him that was very marked.

To his family we extend our heartfelt sympathy, and beg to assure them that their sense of loss is shared by a very large number of friends who liked him as a man for his many good qualities, and who now say without exaggeration that the world is brighter by reason of their having known him.

On behalf of the Society, FRED. S. BENSON, CHAS. H. NETTLETON, E. G. LOVE, JAMES H. JOURDAN, } Committee.

[Communicated by Mr. C. W. Hare.]

A Model Store Building for Displaying Gas Goods.

"The most complete store for the sale of gas lighting and fuel appliances in the world," is the claim made by the United Gas Improvement Company for the latest of its nine stores in Philadelphia, which was opened March 14th last, at 1033-35 Market street. Nor is it likely that the claim will be disputed, and gas men, and the general public alike, have welcomed this store as not only an innovation in its line, but also as an educational center of permanent value. Since the opening day the throngs of visitors and the corresponding sales records have more than justified, in the minds of its originators, a commercial step of such creative and financial magnitude.

In taking the step a big theory was put to the test. The question was, whether a gas store should be merely a place to display goods, or, whether it could be made attractive from a business-making point of view, just as a great department store or jewelry store. This meant that, since gas appliances are in themselves prosaic in appearance, unusual ingenuity must be displayed in arranging them so as to make a strong appeal to the buying public. This would necessitate large expenditures in equipment and exceptional taste and imagination in the way of arranging window and store demonstrations.

The store itself was built on one of the busiest corners in the heart

Store, Northeast Corner 11th and Market Streets.

of the city. It is of cement, 4 stories high, the floors above the mezanine being used for offices of the Company's New Business Department.

A complete exhibit of gas appliances and lamps was, of course, provided, and this means that here can be seen not only the standard articles, but the latest ideas in artistic fixtures and glassware, and the many conveniences perfected for the use of gas. All appliances are shown in operation, and, in many instances, as they would appear in the consumer's home.

The principal features to attract attention are the exhibition rooms on the mezanine floor, which are furnished as an example of a good residential interior, the industrial exhibition in the subway store, showing blast and atmospheric burner appliances, the display of artistic gas fixtures, each equipped with a central gas control, and in many instances supported by a gas chain. The method of control for the ceiling lighting in the main store, for the show windows, and for the outside arc lamps also caused highly favorable comment. The lighting of the building, both exterior and interior, has been a

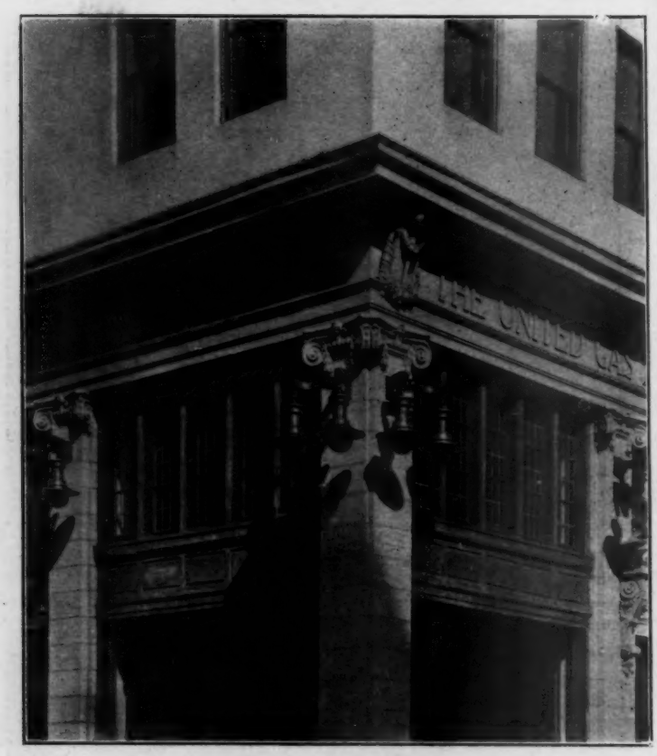
Mezanine Floor.—Dining Room Display.

Mezanine Floor.—Living Room Display.

Subway Basement Exhibition.

revelation to many. The exterior is lighted by No. 1,911 arc lamps, hung on specially designed bronze brackets, which brilliantly light the front of the building, the sidewalk and the street. These lamps

Section of Subway Basement Display.



Detail of No. 1,911 Welsbach Arcs on Bronze Brackets.

are controlled by magnet valves from a push button inside the building. The main store is lighted by 12 reflexoliers of special design, hung from the ceiling and equipped with magnet valves operated from a central point within the building. The show windows are lighted by a row of reflex lamps, with holophane reflectors, operated in a similar way to the arc and ceiling lights.

In the exhibition rooms, on the mezzanine floor, the lighting is subdued by the use of artistic glassware in keeping with the interior treatment of the rooms. Both the inverted and upright lamps are used in these rooms, and all fixtures are equipped with central control cocks. The scratch of a match is never heard throughout the building.

The industrial exhibit in the basement is particularly comprehensive, showing a wide variety of appliances, all connected, ready for use. This gives the manufacturer an opportunity to test on the spot the merits of the appliances adapted to his individual requirements. Here, also, is installed the system of gas engines which operate the elevator and ventilating system of the store.

Space will not permit a detailed explanation of the many attractive

Interior, First Floor.—Display Floor.

features of this store, but we show herewith a few of the views which may give some idea of its interior arrangement.

[Proceedings, as Furnished by the Secretary.—Continued from page 732.]

FORTIETH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held at Young's Hotel, Boston, Mass., Feb. 16 and 17, 1910.

Second Day—Morning Session.

Discussion on the Wing Paper Concluded.

The promised matter subsequently forwarded by Mr. Wheeler is as follows:

The difficulties experienced in your water gas plants in [illegible] cost of operation, as well as in sudden drops in the candle your stored water gas, are almost entirely due to a neglect of t duction and distribution of the heat in the machines. These he[illegible] are due to the fuel combustion, of course, but the fuel has been improperly handled and some important matters have been overlooked. In the first place, the oil has been improperly handled throughout the carburetter and superheater, due to excessive heats plus sudden drops of temperature at the ends of the runs. If you will enlarge the space over the carburetter bricks, so that the oil, when sprayed in under not less than 30 pounds pressure, can have a space to become gasified in before striking the hot bricks, the illuminants in the oil will be preserved instead of being burned up by breaking down into free carbon and non-illuminating gases. If enough firebrick checkers be removed to make a chamber, having not less than 3½ or 4 feet of clear height below the sprays and above the top checker layer, this important feature can be made effective because then you can reduce the amount of oil consumed per 1,000 from 4.75 gallons per 1,000 to 3.50 gallons, a saving of 1.25 gallons per 1,000 for same delivered candle power. To completely insure this economic operating condition, reduce the temperature carried at the outlet as well as the inlet of the superheaters. The oils under the new condition of being more scientifically handled in the larger carburetter space over the checkers, will now be more safely fixed in the lower temperatures of the superheater checkers, and will leave the apparatus so completely fixed that the losses due to condensations in the remaining series of cooling, storage and distribution operations, will be at a minimum. If the superheater temperatures be made more uniform by reducing the high initial and increasing the lower end temperatures now prevailing in the superheaters, a more certain and permanent fixing of the oil gases will be assured. This condition can be obtained by installing recording pyrometers on the superheaters. Your individual works' temperatures are somewhat dependent upon the oils used and the apparatus, but 1,370° F. would seem to be the maximum allowable superheater temperature. The sudden drops of candle power experienced so frequently in gas

standing a day, or even a few hours, in your holders are also caused by the heat effect upon the oils fed into the machines. The heats carried are so high that the oils upon being gasified are then broken down into probably a considerable percentage of acetylene. The gas upon leaving the works for holder shows up a fine and brilliant candle power, due to the acetylene content more than to a benzol content. The flame looks particularly white and brilliant. After standing, however, at times, the gas upon combustion shows a poor, dead, light, a loss of several candles. The acetylene has broken down into lampblack and hydrogen, due to the baking temperatures it experienced in the checkerbricks. It is believed this theory accounts for the phenomena better that the benzol theory which claims that excess of benzol present in the gas condenses on short standing travel, due to the vapor tensions of the constituent oil gases carried in the gas. The precipitation of benzols under these tension laws follows with its corresponding drop of candle power. In the second place, the costs of gas making at the works seem to be increased by constant and excessive clinkering with fuel wastes, heat wastes and high labor, all coming together as an incident thereto. Analysis develops a bad ash in your coke used. As the different plants use some anthracite and some coke, a study has been made of the ashes, so productive of clinker. Experience, however, has shown that, even if the ash in the fuel used is dangerous and beyond the limit of economic operation, changes in the steam admitted and the times of blowing and gas making will greatly change the objectionably high costs of the operation, and produce a much better result. It is here suggested that you employ a chemist and have analyzed the ash of the fuels used, tabulate them in accordance with the following discussion and see whether they fall in the danger class. If they do, and you are unable to contract for a better fuel, at once change the method of steam admission and of blowing, reversing the steam frequently, shortening the times of actual gas making, and keep the fires alive down to the grate as far as possible, blasting hard. It is not necessary to employ a shaking grate. The same result can be obtained by keeping the steam and times of blow and make under a closer watch with more frequent light cleanings during the 24 hours. Measure the steam admitted in steam meter. The fuels you have used this past year have varied widely in their ash, and the employment of a chemist constantly would seem a wisely added operating expense. The rule following was worked out from the singular analogy between the slagging operation in copper smelting and the blasting up and clinkering operation in water gas manufacture. In copper smelting, the constituents forming the slag are analyzed for acidity and basicity, and the components so adjusted that the resultant slag is fluid, freely flowing, of proper gravity, and, when run out of the furnaces, is jetted with water, which disintegrates the fluid slag into sand, washed over the dump. In water gas generation, the air blasting raises the same temperature on the grate as in copper smelting, and the acid and basic components of the coal or coke ash are in part fluxed into a slag, which rains down through the lower sections of the active combustion zone upon the bottom fuel layers, and builds out from the generator sides like a bridge. The succeeding time interval of gas making blows through this liquid slag a quantity of vaporized water (steam) in excess, some of which liquates and further assists the fluid slag to disintegrate into ashes. This fact is readily discernible by examining the ashes as a water gas operation with a microscope. The original ash in melting up and partially disintegrating again into ashes has rearranged itself somewhat. The ideal ash should stay ashes and if fluxing permanently, to be sufficiently fluid to run into small drops and not "dough up" or "wax up" into troublesome masses of viscous, waxlike clinker, sealing over the steam passages through the fuel and when withdrawn laboriously by the clinker-men, not hardening into huge masses almost impossible to remove through the doors. A waxing clinker reduces tremendously the output and efficiency of the generator and increases the labor account to a surprising degree. The copper smelters divide their slags into grades, tabulated to show the ratio of basic oxygen to acid oxygen.

Kind.	Ratio Oxygen in Base to Oxygen in Acid.	Quality.
Subsilicate	More than 1-0 to 1-0	Very thin liquid, corrosive.
Unisilicate	1-0 to 1-0	Thin, flows freely, brittle.
Sesquisilicate	⅔-0 to 1-0	Thin, slightly viscous, suitable.
Bisilicate	½-0 to 1-0	Requires high temp., fine.
Trisilicate	⅓-0 to 1-0	Tough, viscous, stringy, glossy.
¼-Silicate	¼-0 to 1-0	Viscous.

The copper smelter endeavors to make a sesquisilicate or a bisilicate. They dislike to have much Al_2O^3 in their slags, as it often goes over into the acid side in the presence of considerable FeO and CaO and forms an adhesive non-flowing compound. The water gas operator, however, prefers Al_2O^3 in quantity when his FeO is small, and the latter is usually much lower in amount present than in copper slags. He prefers a unisilicate and some of the sesquisilicates and would like a subsilicate if it did not eat out a ring into his generator linings. Ashes enough high in silica to form a bisilicate *flow readily under a heavy blast.* With the following oxygen table, we will run over, first, some well established anthracite coal ash analyses and see how a silicate rule behaves.

Matter.	Per Cent. Oxygen in Composition.
Silica SiO_2	= 53.33
Ferrous oxide FeO	= 22.22
Manganous oxide MNO	= 22.60
Lime CaO	= 28.60
Magnesia MgO	= 40.00
Alumina Al_2O^3	= 47.00
Ferric oxide Fe_2O_3	= 30.00

Remember that it is desirable to have in the generator ash high, and nearly equal, proportions of SIO_2 and Al_2O^3, and very low FeO, CaO, MgO, etc., and also remembering that each 1 per cent. ash wastes 2 per cent. carbon in the fuel.

Anthracite Coal Ash.	No. 1.	No. 2.	No. 3.
SiO_2	54.67	46.23	46.50
Al_2O	41.95	31.93	16.45
FeO	Trace	14.54	18.15
CaO	1.82	5.04	11.80
MgO	1.46	2.26	4.63
Action in generator	Good.	Fair.	Bad.
Basic oxygen	20.82	20.58	16.99
Acid oxygen	29.15	24.65	24.79
Taking whole numbers	20 to 30	20 to 24	16 to 24
Silicate ratio	⅔ to 1	Note—5 pr. ct. Al_2O^3 Acts Acidly, therefore we ge. probably	⅔ to 1

Kind of Silicate.	Sesquisilicate.	Unisilicate.	Sesquisilicate.
Approx. temp. slag formation.	2,650° F.	2,336° F.	2,050° F.
Kind of slag	Melts tardily. Brittle.	Thin fluid. Heavy Brittle.	Tough, viscous thready and waxy. Evidently a trisilicate. Then Al_2O^3 goes to acid side.

And we have:

Basic oxygen	9.26
Acid oxygen	32.38
Taking whole numbers	10 to 30
Silica ratio	⅓ to 1
Kind of silicate	Trisilicate.

In the above table the per cent. of each component is multiplied by per cent. oxygen content from the above oxygen table, and the acid and basic oxygens separately added. Since the above three analyses are averages of a large number of cars each, and the coals were actually tried out in the generator, we can see from inspection of the table that a sesquisilicate free from FeO is O.K.; that unisilicate works fairly well; that a sesquisilicate high in FeO, CaO, MgO, and lower in Al_2O^3 works very badly, acting as though it were a trisilicate; the Al_2O^3 uniting in great part with the acid side. Dr. Fulweiler has recently stated: Avoid an ash containing

SiO_2	below	30 per cent.
Al_2O	"	30 "
FeO	above	15 "
CaO	"	10 "
MgO	"	3 "

Let us now apply the silicate rule to 4 analyses of Chicago cokes. We see from this table (p. 774) that No. 1 oven mix was very high in iron, but so low in Al_2O^3 and the earths that its sesquisilicate worked well, but that No. 2 oven mix, while not as high in iron, was much higher in Al_2O^3 and produced a ⅔ to 1 silicate, a viscous slag, becoming hard and heavy. We see that the Vandalia analysis indicates an unsatisfactory condition of affairs, as Vandalia will probably make a viscous, sticky slag. Herbert should be a good coke, but will dough up on low steam. We also note that the composition of the satisfactory No. 1 oven mix is directly opposite Dr. Fulweiler's table of avoidance above. We also note that No. 2 oven mix composition "unsatisfactory," is almost identical with No. 2 anthracite composition "Fair." Now, this indicates clearly to my mind that these cokes, even while dangerous, can be so handled that heavy blasting with short runs and frequent cleanings, measuring all steam admitted and changing the up-and-down blows in a proportionate ratio, will

	Vandalia Coke.	Herbert Coke.	No. 1 Boomer Mix.	No. 2 Boomer Mix.
Per cent. ash present	....	....	8.30	8.70
SiO_2	48.91	52.93	46.30	46.06
Al_2O_3	30.37	32.51	17.97	29.09
FeO	10.42	7.72	26.52	16.46
CaO	3.87	2.25	1.51	2.06
MgO	1.09	0.96	1.53	1.73
Action in generator	....	....	Satisfactory.	Unsatisfactory.
Basic oxygen	18.02	18.13	15.38	18.61
Acid oxygen	26.08	28.23	24.69	24.56
Taking whole numbers	18 to 26	18 to 28	16 to 24	18 to 24
Silicate ratio	⅔ to 1	⅔ to 1	⅔ to 1	3 to 4
Kind of silicate	Sesquisilicate.	Sesquisilicate.	Sesquisilicate.	⅔ to 1
Approximate temperature slag formation	....	....	2,050° F.	2,085° F.
Kind of slag	Viscous, bad.	Good.	Friable, good.	Viscous.

obviate the troubles of slagging and produce a good operation. Barring the magnitude of ash per cent., both the Smith's run and English mine coke ashes produce a good slag.

Per Cent., Ash.	Smith's Run, 14.45.	English Mine, 14.99.
SiO_2	55.55	51.87
Al_2O	36.75	44.87
FeO	....	....
CaO	4.20	1.08
MgO	1.04	0.25
Basic Oxygen	18.88	21.50
Acid oxygen	29.62	27.65
Taking whole numbers	19 to 30	21 to 28
Silicate ratio	⅔ to 1	⅔ to 1
Kind of silicate	Sesquisilicate	⅔ Silicate
Kind of slag	Good, friable	A little viscous good

Dr. Peters has remarked that where Fe_2O^3 enters as such originally, before slagging, into the ash, the temperature of formation is greatly raised, and for copper smelting it is a most undesirable element, but I would say for a water gas generator it would be a good mixture. It is possible that this explains why the No. 1 oven mix was so good, because the high iron was originally present in the ash, both as FeO and Fe_2O^3, and, therefore, part went through due to the interior temperature uncombined into a slag. Restating the above discussion, we have the following:

Subsilicates .....Good, but corrosive on linings.
Unisilicates..... Good.
Sesquisilicates....Free of iron, good.
" ....Low in Al_2O^3, but high in FeO. Good. Iron probably both FeO and Fe_2O^3.
Trisilicates .....Very bad.
⅔ Silicates .....Usually viscous and dangerous, but if free of iron O.K.

Determine the above silicate degrees by the oxygen table above. This table applies to either anthracite coals or cokes. If impossible to change the fuel under contract, nevertheless the running of the set can be so changed as to make the bad constituents of the ash more fluid so that the slag will be thinner, less sticky, and will run down onto the grate where a more frequent but light cleaning can remove the same. The above scheme when consistently carried out with the assistance of a chemist, will prove a great saver in running expenses.

	Three Well Known Penn. Cokes.		
Per Cent.	No. 1.	No. 2.	No. 3.
Ash	?	5.96	6.40
SiO	40.90	46.15	52.20
Fe_2O_{33}	32.87	10.17	1.42
Al_2O_3	15.99	36.13	36.38
CaO	3.06	2.76	2.56
MgO	7.18	0.22	0.87
Basic oxygen	21.12	22 91	18.60
Acid Oxygen	21.81	24.61	27.84
Silicate ratio,	1 to 1	Approx.	⅔ to 1
Kind	Unisilicate. Thin, fluid, runs on to grates. Drips in strings.	Unisilicate. 42 per cent. will mat on a boiler grate.	Sesquisilicate. 26 per cent. will mat on a boiler grate.

The President—I would like to hear something from Fall River on this question; Mr. Nute or Mr. Leonard.

Mr. Leonard—It seems to me that Dr. Wing has solved the fuel problem. I was over there last summer and what struck me more forcibly than anything else was the short period of cleanings. We clean once in 24 hours. We used to clean once in 12 hours, but found that by lengthening the period of cleaning we improved our fuel results.

The President—Let me break in here to ask what sort of fuel do you use?

Mr. Leonard—Anthracite coal. I have thought during the last few months that we might go to a shorter period of cleaning, although at the present time our results are better than they ever have been before by approximately 3 pounds, so there is some little doubt whether we shall do it or not. We run 4-minute blasts and 6 minute runs, 2 downs, 1 up. While this is a fuel paper, some oil results are quoted here, and in that connection I would say we run our carburetters approximately 1,400°, the pyrometer being at the bottom of the carburetter; and the superheater temperature at the top by pyrometer is approximately 100° less; but, in running two or three machines at one time, we do not attempt to maintain two machines at the same temperature. In other words, the gas maker is allowed considerable latitude in changing temperature. For instance, the carburetter might be 1,400°, and at another time, on the same machine, it might be desirable to run at 1,36)° or 1,300°, and while one machine might be running at 1,350° another might be running at 1,450°. In other words, we try to individualize each machine as to its operation. Amongst the results quoted here the candle power per gallon is given as 5.42. My personal experience as to candle power is that unless the lowest temperature to which the gas has been subjected before it reaches the photometer is stated, the figures are practically worthless for comparative purposes. For instance, this winter we were getting candle power results which figured about 5.1, perhaps not over 5 candles, to the gallon; but that same gas taken at the station meter showed a candle power of 5.82, where the temperature was about 70°. In regard to supplementary bars, one thing about this, particularly in the smaller plants, where you do not have much help, is that the question of cleaning sometimes resolves itself into a question of the available labor supply. It might be not desirable to clean at night, even where you are running 24 hours a day in some plants, and for that reason the longer period of clean might be an advantage to a certain extent. Personally, using anthracite coal, we haven't felt the need of using supplementary bars as yet.

Mr. Miller—Mr. President, Dr. Wing says he uses 13,500 firebrick in the fixing chambers. Can he tell us how many are in each, the carburetter and superheater? I have found the best heating surface per 1,000 cubic feet of gas per 24 hours to be from 1½ to 1¾ square feet of effective checkerbrick surface for the carburetter and from 2¾ to 3⅛ for the superheater. This is for an ordinary, straight-cut Ohio or Pennsylvania gas oil, of from 34° to 36° Beaume. The total for the two chambers figures about the same as Dr. Wing's. In this connection, I would like to know what kind of oil he is using and the character of the oil sprayer. It seems to me that within the past few years very little progress has been made in the spraying of oil in the carburetter. I would very much like to know of any new and efficiet sprayers that have recently been devised. Will Dr. Wing please tell us the temperature he runs in the superheater and the blast pressure under the generator, the amount of steam per 1,000 and the kind of steam and air meters used?

The President—We would like to hear from Mr. C. J. R. Humphreys on this question of water gas apparatus.

Mr. C. J. R. Humphreys—Mr. President, I don't think I can add anything to the discussion. I haven't any figures in my mind this morning which would be helpful.

Mr. Norcross—I should like to ask Dr. Wing, when this blast pressure was increased 33 per cent., to what pressure did that increase take it?

The President—Mr. Cheney has had a good deal of experience with clinkers and methods of getting rid of them. I should like to hear something from him about the rocking grate.

Mr. Cheney—I have here the results of a week's run of one set at Calf Pasture station, made last April, using the same kind of fuel that Dr. Wing uses. While the process differed somewhat from that employed by Dr. Wing, it is in reality the method of frequent cleanings, which he used, carried to its logical conclusion—the use of shaking grates, frequently operated. This process was developed

from exactly the oppo site position from that of the development of generator air meters, since the latter seek to regulate the air supply under varying conditions of the fuel bed, while the shaking grates seek to maintain those conditions nearly constant. The run was made from what might be termed a standing start; that is, there was no preliminary jockeying for a start, and there was no certainty as to the results to be expected, since, while shaking grates had been in use for some time on some of the sets, at Calf Pasture, there had been no opportunity to try them out conclusively up to this time. The rate of make was gradually increased after the first day, but it developed on the fourth day that no further increase was possible on account of the size of the steam connections. The maximum make per square foot of grate surface for 21 hours was almost exactly the same as at Everett, but from start to finish of the week's run no time was lost in cleaning; the amount per hour per square foot of grate surface was not so great. Changes in the running were made from time to time, particularly in the first days of the week, or before the make had been brought up to the maximum. What changes were desirable, and the effect of the changes when made, were determined by frequent analyses of the blue gas for carbonic acid, the analysis apparatus being arranged so that a sample of gas was taken, analyzed for carbonic acid and thrown away in about 40 seconds. It was possible to get at least 5 tests per run for each of the 3 runs between coalings, and thus ascertain quickly at any time just the conditions existing in the fire. The coke used was taken from open storage and varied considerably in the quantity of moisture con tained, as there were some hard rains during the week, and this necessitated some changes in the time and the pressure of blast. Throughout the week the approximate length of blow was 3 minutes and of run 5 minutes. Tests taken at the end of the week, when conditions were fairly constant as to the rate of make and moisture in the coke, showed 4.5 per cent. of carbonic acid in the blue gas and 3.1 per cent. in the finished gas. The inside diameter of the generator is 6 feet, 2 inches, and the depth of fire carried was about 7 feet.

The maximum daily make was.....	1,413,000 cubic feet.
The average daily make was.....	1,375,000 cubic feet.
Gross coke per 1,000 (including moisture, etc.)...	33.87 pounds.
Oil used per 1,000	3.85 gallons.
Candle power per gallon.....	5.59

At the end of the week's run the fire was drawn, and although the stoke-holes had not been opened during the week and no barring down had been done, the walls were found to be free from clinker some 12 inches above the grate, and even in this low belt the clinker was not over an inch or two thick. The condition of the walls showed that a considerably higher fire temperature could have been carried without injurious effect.

The President—Mr. Barnum, how do your water gas results compare with your coal gas? Are they as good in proportion?

Mr. Barnum—I congratulate Dr. Wing upon writing a paper on water gas in which so much attention is given to the more important end of the apparatus. Heretofore papers on water gas have given more attention to the carburetter and the superheater. It has truly been said that the money is made or lost in the uniform condition of the fire obtained to a certain extent by frequent cleanings and secondarybars by Dr. Wing, and more fully obtained by Mr. Cheney, but the intermittent shaking, is certainly a step in the right direction for higher efficiency and economy.

The President—Capt. McKay has had a good deal to do with the erection of the plant at Everett, and I am going to ask him to say something on this paper.

Capt. McKay—The interesting statement that Dr. Wing has boiled down into such a condensed form may possibly be somewhat further summarized by quoting from Mr. Barnum's paper of yesterday; the Doctor has done the same thing in relation to water gas that Mr. Barnum described in relation to coal gas producers. Mr. Barnum says in his paper, "An important factor in the running of the producers is the removal of the ash as quickly as it is formed. It is as important to keep the fuel active, as far down near the grate as practical, as it is to keep the producer filled with fuel." Mr. Cheney did not state the interesting fact in connection with the shaking grate, that he ran three weeks without cleaning at all, and then some outside circumstances interfered with the continuance of the run. The question raised by Mr. Leonard in relation to candle power the Doctor will answer, but I have some information which perhaps he has not at hand. During an average month (October) of the year, after this gas had been tested with the results quoted by Dr. Wing, the gas, after flowing 16 miles, showed a difference in test of ¼ candle. The second test was made under conditions and with results that indicate an illuminating value as nearly fixed as it could be. I congratulate the Doctor on the work that he has done with this apparatus. It certainly is better than we anticipated. I also, Mr. President, with your permission, will congratulate the Association on its success in getting the Doctor on the floor. I have been trying to do it for 7 years. [Laughter and applause.]

The President—I should like to ask Mr. Barnum to explain the working of their rocking grates in connection with this paper. The matter is covered in Mr. Lamson's paper, but I should think it would be well to have it in connection with this discussion also.

Mr. Barnum—The rocking grates are operated by a motor and drive, one motor operating the grates for 10 producers.

The President—Any further discussion or remarks on this paper? If not, I will ask Dr. Wing to answer the questions.

Dr. Wing—In regard to clinkering, when we first received this quality of coal for making coal gas and making gas coke, and began to use it in the generator, at the first cleaning everybody who saw the bottom of the generator had to groan, and most everybody wanted to lie down. There was a black, glassy mass clear across the grates. That is the first we ever saw of it, and that was over 2 years ago. From that time we have been working to get the mastery of it. We simply had to manage it and find the conditions for using it. The short cleans, as stated in the paper, are limited to 5 hours, because, with the average amount of coke ash, it is about as bulky as can be quickly handled, but it does not get very deep. Of course, it cannot get as deep, for it has practically the same amount of ash as any other coke, and it cannot accumulate as much in 4½ hours as it can in 24. We find in the frequent cleanings (we measure or weigh the amount taken out at each cleaning), and we handle what comes off the grate and through the grate, about 15 per cent. of the coke; and formerly cleaning the 8 feet 6 inches generators through the doors in the usual manner we had 22 or 23 per cent., that is 50 per cent. more in the infrequent cleanings, and very hot. In our management very few lumps of incandescent fuel run out of the doors; the clinkers are red hot, hot enough and uncomfortable enough. The pyrometer temperature carried at the base of the superheater was 1,350°. We change around in a wandering sort of way when the results are not so good as usual. We tried to run at 1,400° at that point and were satisfied it was a little too high. With the quality of oil we frequently had in our tanks at that time it was altogether too high, because it filled up the outlet pipes quickly. We used no oil heaters and practically do not have to clean the outlet pipes in the usual manner, by opening the pipes, until the generator comes down for repairs, and that may be in from 30 days to 90 days. The temperature is sometimes run as low as 1,250° at the bottom of the superheater, as we are wandering around to find the best point. We get very variable qualities of oil. The oil results are stated in the paper, and I can say they are honestly taken. We can get higher figures if we want to work the proper burners and work the proper temperatures, but are satisfied that the candle power carries pretty well for the long distances this gas has to travel. The gas as metered, to answer Mr. Leonard's question, is seldom below 72° and seldom above 78°. After it leaves the meter it goes perhaps 1,000 feet through the underground pipe, and it comes to the place where it is tested at the inlet of the holder, and the test-pipe which runs to the pyrometer room is rather poorly situated, so we feel sure all the time that our candle power is honestly taken, with a good deal of margin if we were to improve the conditions. As to the bricks in the carburetter, in answer to Mr. Miller's question about the square feet of surface to the number of bricks, there are about 3,000 in the carburetter when it is full and 10,000 in the superheater when it is full. We carry 1,000 or 2,000 less usually. The carburetter bricks are low; they must be 4 feet below the end of the oil spray, which gives quite a large fall and a chance for the oil as it sprays to spread to all parts of the surface. The bricks could be piled up 1½ feet higher, but the oil would have to have a very inconvenient form of cone spread out so widely to cover all the surface. It is hard enough to get any sort of distribution of oil, but we have an unusually large fixing chamber capacity and can very well afford this empty space at the top of the carburetter to enable the oil to spread. The oil is of all sorts; I presume it is mostly Texas oil, with a specific gravity of 32 or 34. That is about all I can say about it. It distills like a good many other samples of oil we have had from time to time in recent years. It really does not make very much difference, after you learn the peculiarities of any single cargo. We have got so that we can use one lot about as well as another. The spray is the same one that the builders put on the apparatus finally, and we have used it ever since. It has a rose-nozzle, drilled with a lot of $\frac{1}{16}$-inch holes, is a hemisphere made of cast steel and is on a sliding stem. Most of them are the original sprays that were put on there over a year ago. Some have run loose on the thread and fallen down. We formerly ran the pressure on the oil pipe up to 60 or 70 pounds, but find it answers very well to have the oil pressure 40 pounds at the pump. We get a very good oil spray all over the 8 feet interior of the carburettor. Of course the change reduced the strain on the oil pipes. The blast pressure we formerly used, before we began on this new system, was about 21 inches, and ever since then we have run pretty constantly at 23 inches blast pressure. It nearly all gets to the bottom of the generater, at any rate when the pressure steadies down. As one machine after the other is put on or shut off it will vary a little. That is, the pressure that is kept in the blower room. As far as that goes, there is no particular inconvenience in a high pressure. The steam per 1,000 in the only

machine we have a meter on we presume is about 30 pounds. We haven't had an opportunity to measure the make of that machine independently, as the whole lot of machines make gas, but we presume it makes the same as the others, and we set the steam at 30 pounds. The conditions in the generator which we use for a standard in determining that seem to be just about the same. I fancy that is about what it is in all the sets. As we change the amount of steam used for varying qualities of coke at the generators, we find we have to change them all and apparently in the same proportion. The total amount of water used for every purpose at the works, which includes some other items than gas making—heating, and in the old part of the works, the purifying house—is about 1.4 feet per 1,000, that is at this time of year. It was 1.25 feet last summer, right through the summer; 1.25 feet is about 80 pounds of city water used per 1,000 feet of gas made. In that connection we made a steam test at the North End works, where we were running the Wilkinson process, which is about as straggling a process and straggling works as we can run together. The steam made at the boilers was 127 pounds per 1,000 feet of gas made, that is exclusive of water for any other purpose. Mr. Barnum's method of using shaking grates is, of course, only analogous to frequent cleanings of the bottom of the firepot. That certainly accounts a good deal for his uniform conditions. Our cleanings every 5 hours leave the conditions in the generator almost uniform right through. We are satisfied that the gas make is just about the same from the beginning to the end of the 5-hour period, from actual tests. Instead of having to vary the oil and steam for a period of a 12-hour cleaning or for a period of 24 hours, it is much more satisfactory and simple to set it as we do and know that it is going to be uniform. I thank you, gentlemen.

Mr. Prichard—Mr. President, I move the thanks of the Association be extended to Dr. Wing for his paper. In my opinion it is a very important paper, for the Doctor has not only shown us how we can economize in the cost of water gas making, but he has shown us how we can economize in the cost of coal gas making, because he has shown how we can utilize the residuals that we get from the West Virginia and other coals which are coming into the market at a somewhat lower price, and a little higher quality of coal in some respects.

The President—It certainly gives me a great deal of pleasure to put the motion as made by Mr. Prichard. [Adopted.] Dr. Wing, I am very pleased to extend to you the thanks of the Association. Capt. McKay, I believe, has a matter to propose.

Fraternal Greetings.

Capt. McKay—Mr. President, I move that the Association telegraph its greetings to the Southern Gas Association, now in session at Chattanooga, Tenn. [Adopted.]

The President—The Secretary is instructed to extend greetings from the New England Association to the Southern Association. If there is no further business to come before us, we will proceed to close our fortieth annual meeting. Have you any announcements to make, Mr. Secretary?

The Secretary—Mr. President and Gentlemen: There is one thing I would like to say. We have always been very particular that the report of the discussion at the meetings should be sent to each speaker with a notice asking him to correct the report of his remarks and return it to the Secretary. The journals have sometimes felt that they have been unduly delayed in getting the report; but the Secretary cannot furnish the revised report to the journals or to anyone else until it is sent back to him. So if you will kindly bear that in mind and send back your revised statements at your early convenience it will help the Secretary some and possibly the journals more.

Adjourned.

The President—I want to take this opportunity to thank the members for their attendance and for the part they have taken in the discussions, and especially to thank the Secretary for the work he has done. Anyone who has occupied the President's chair cannot fail to appreciate the great amount of work which has to be done by our Secretary. If there is nothing more to come before the meeting, I declare the 40th annual meeting of the Association closed.

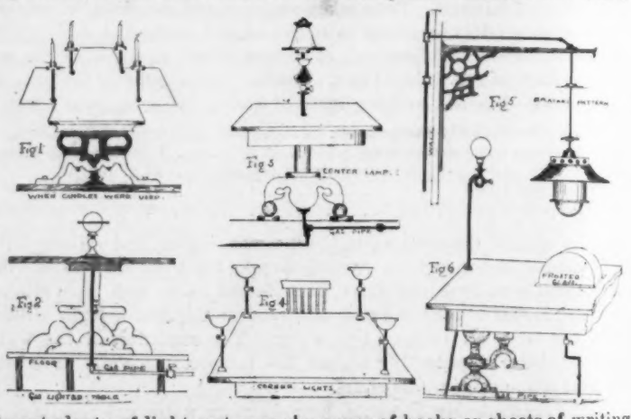
Table Lights.

[Communicated by "R."]

Fig. 1 illustrates a form of table lighting followed in certain homes, hotels, dining establishments, etc. The fad for table lighting commenced some years ago, but was not developed to the extent of requiring the attention of gas and electric lighting engineers and designers until recently. Candles, oil lamps, carbide gas and ordinary illuminating gas table lights were employed in all kinds of ways until the lighting mechanics took hold of the proposition. Sometimes the persons desiring to establish a system of table lighting used a number of stands or small brackets on which to place the individual illuminants. This proved an unhandy and cumbersome way. The lighting engineers have combined with the requirements of the designers of household articles, and at the present time it is possible to procure very well lighted dining room and card tables perfectly fitted out with the needed combination of lights. Commonly the lights are arranged so there will be one at each corner of the table, as shown in the first sketching. The imitation candles, which are of porcelain, are furnished with the required imitation gas tips so that gas can be passed through the spindles and fed to the tips for ignition. The candles pieces are fitted with the required type of metal coupling with the upright of bronze or other metal, and this bronze support is hollow so that it can convey the illuminating material to the gas tips. The bronze tubes are joined together beneath the table top with a pipe which reaches to the gas main. There is a controlling check valve in this connection so that the gas can be turned off and on at will.

Another form of established table lighting consists in the employment of a single gas arc, or other form of light, adjusted in the center of the table, as shown in Fig. 2, which gives a cross-sectional drawing of the combination, illustrating the manner in which the gas main is used to project the upright pipe through the center support of the table to the lamp on the top. The gas pipe is tapped through the flooring. In places where it is desired to have center table lights of a fixed order this plan is quite popular. The lamp can be as artistic as desired, or a very plain burner can be used with a common shade. Sometimes the hues and tints of the shades used on the lights thus fixed are very attractive. By having the light secured in the table center, the occupants of the table obtain all the advantages of the light. There is a certain homelike effect produced when persons dine at tables on which the light burns brightly, just as the old, smelly and objectionable kerosene lamps used to smoke and burn dimly on the dining or reading tables of our fathers on the farm. It is a cosey experience to assemble in parties of two or four about the table in the public eating hall with the independent illuminants for your table. The caterers to the public taste have discovered this fact, and that is why many of the leading eating houses are adopting the individual lighting system for the tables. When the lamp is fixed low on the table and tinted shades are used, it is possible to get brilliancy of illumination on the table and the foods without casting much light at the level of the eyes. Some persons like to eat this way, consequently some of the tables which have been furnished with the lights are so planned that it is possible for the occupant of the table to adjust the light up or down with a thumbscrew adjustment.

Fig. 3 illustrates a form of lamp which is used on some types of tables for special purposes. These styles may be seen provided for the reading and lighting tables in hotels, depots, public places, reading rooms, libraries or wherever it is likely that someone will desire



to get plenty of light cast over the pages of books or sheets of writing paper. By the establishment of tables thus fitted in public houses considerable additional patronage has been procured by the management. The writer was shown some very neatly fitted tables of this order, at which guests found comfortable seating capacity with a desirable and effective light for reading or writing. Then, again, we find that some of the persons who use the table lights prefer to have a more elaborate display, as shown in Fig. 4. This involves the placing of a lamp for burning gas at each corner of the table. Often the shades are brightly tinted and present a beautiful appearance when the table is decorated for a dining party. With the corner lights, the light for the table is cast towards the center of the table from the space between the shoulders of the persons seated about the fare. As the shades are almost always toned down with hues of colored silk or paper, the brilliancy of the flare is not felt directly upon the eyes. The hostess usually regulates this by toning the shade covers to the right thickness for the impregnation of the rays of light. One finds some drop lights supported by a metal swinging brace, as in Fig. 5, used in other places. One first class restaurant had a number of the wall braces made of imitation brass, and these brasslike supports were used to hang out the gas arc lights over the tables. The gas for the lamp is secured by tapping the main in the wall.

Still another form of lighting the table is obtained by using a single projecting pipe, as in Fig. 6. A ball globe is fixed on the top in which the required modern form of tip is used for procuring the best possible gas light. In another pattern of table light the project consisted in having a square place cut out of the table top in which the oval frosted glass top is placed, as shown in the same table illustration, Fig. 6. A gas pipe carries the required volume of gas to the three or four jets inside of the frosted glass top and these lights burn brilliantly enough to throw a light across the table and illuminate the foods and dishes in the event of a dinner going on. The same plan is applicable to the card table, the writing or reading table or table on which anything may be displayed, such as in the stores. The plan of advertising wares by means of separately lighted tables containing the goods has proven itself profitable in some of the department stores where one may observe the independent table system of illumination in service.

[Concluded from Page 736.]

REPORT OF PROCEEDINGS, FOURTH ANNUAL MEETING, AMERICAN GAS INSTITUTE.

Held in the Hall of Elks, Detroit, Mich., October 20, 21 and 22, 1909.

Afternoon Session.

The Chairman here called upon Mr. J. O. Luqueer to read his paper on—

THE ACCEPTANCE AND INTERPRETATION OF DATA.

The acceptance and interpretation of data broadly considered cover every field of human endeavor; the physician in his diagnosis, the lawyer in the examination of witnesses and the preparation of his case, the engineer in the solution of his problem, the business man in his trading, the farmer in the cultivation of his land; and so on through the whole range of activities that demand the exercise of man's power of reasoning.

Data may be defined as a collection of facts either indubitably known or treated as such for the purposes of a particular discussion. In this definition we have in large measure the explanation of the fact, that, in the industrial world, it is the man of experience who commands, for, by reason of his exact knowledge, he readily accepts or rejects data with certainty where another must assume.

No matter what the breadth of experience, however, there is no escape from assumption in many of the problems that present themselves, and perhaps the most important and difficult problems because of this very fact that the premises are not, and cannot be, indubitably known. Obviously, no correct conclusion can be deduced from incorrect premises (except by the merest chance) nor will the best of data avail if it is misinterpreted.

No doubt this is well understood and appreciated and it may, therefore, seem presumptuous to come before this convention to urge care in the acceptance and interpretation of data, and yet that, in part, is the purpose of this paper, and it finds its justification in the many evidences of lack of care and disregard for the truth, frequently so apparent that "he who runs may read," but more often only disclosed upon anaylsis and verification.

Recently a set of experiments was conducted by four men of unquestionable ability in their respective lines, three of them known to many of you, and one a member of this Institute. The results were testified to over their signatures, great stress being laid upon the care with which the tests were made, yet the sampling was done in such a manner as to render the tests as a whole practically worthless. The fact that the conditions were peculiar and the provided means for sampling so entirely plausible may serve as an excellent excuse, but it is small consolation to the client who has paid for expert services, presumably in order that he may not deceive himself and others. Then, too, excuses are damaging to reputation which is a possession well worth every effort made in behalf of its preservation.

Another apt illustration of failure in verification may be found in the evidence in the recent case of the Consolidated Gas Company of New York, which, by the way, discloses many instances of the acceptance of faulty data. The testimony in the examination of a witness for the State of New York reads as follows:

"Q. From your experience and from your investigation as to the cost price of other modern and up-to-date companies, what would you say it would cost an efficient, modern plant, efficiently and economically managed, to produce gas and put it in the holder in the City of New York?"

A. "Considering the immense amount in New York City of gas and the prices prevailing here, as shown in the accounts of the companies which I have looked over, and comparing it with the results and apparatus of a similar kind in other cities, I think the price cost per 1,000 could be reduced to 24 cents."

Q. "For a 22 candle power gas?"

A. "Yes, sir."

Upon cross examination, the record continues:

Q. "Will you name any city where the gas is produced at 24 cents in the holder, including repairs and expenses and distribution as to works, as well as labor, and material and enrichment, and so forth, up to the holder?"

A. "Yes; I think that, if I remember rightly, New Bedford, Mass., has as low a price as 24 and a fraction."

Q. "You do not claim they maintain 22 candle power in New Bedford, even on the average or usually?"

A. "I don't think so. If I remember rightly, they maintain 18 or 19 candle power."

Q. "Now will you be good enough to divide here this 24 cents which you have said should be the cost in New York, indicating how much should be the cost for coal, how much for oil, how much for labor, and the other elements that go to make up the cost in the holder?"

A. "Well, I made this cost up from operations in other cities * * * I will have to take time to make up such a statement as that."

Q. "You do not mean to say that you have given this 24 cents without making up a statement?"

A. "As far as that is concerned, I had the prices of those other companies in view, and being smaller, and some of them not as well situated as New York, I had a right to assume that they could do as well in New York * * *."

Further questioning failing to reveal the names of any of these "other companies" aside from New Bedford, the basis for this assumption seems somewhat meager, but dwindles to insignificance in view of the actual conditions in that particular city. Investigation developed the fact that the New Bedford Gas and Edison Light Company had never produced its gas at a cost closely approaching 24 and a fraction cents per 1,000 feet in the holder, nor could the records of the company in any conceivable manner be construed as having shown such a low cost. The evidence of the witness thus becomes valueless; the manner in which he may have been misled is indicated later in the testimony in rebuttal by one of the witnesses for the Consolidated Gas Company, whose explanation passed uncontradicted and is as follows:

The report of a Special Committee to consider the London Sliding Scale was issued not long previously and contains a table giving certain data prepared from the returns of the Massachusetts companies to the Board of Commissioners. Among others, there are two adjacent columns in this table, one headed "Cost of Production per M. Feet Sold" and the other "Cost of Distribution per M. Feet Sold"; and it so happens that, in the case of New Bedford, the amounts in these two columns are transposed, the cost of production per 1,000 showing as $.254 and the cost of distribution as $.3865, whereas, the latter was the cost of production and the former the cost of distribution. The 25.4 cents per 1,000 feet sold would reduce to 24 and a fraction cents per 1,000 feet made.

The State's witness, however, having committed himself to 24 cents per 1,000 for the cost of 22 candle power gas in New York proceeded to make up a statement to show in detail how it was to be accomplished. The attempt to bolster up a preconceived conclusion based upon such flimsy data led from one mistake to another and resulted in a veritable comedy of errors. As the witness expressed it, the gas was to be "almost entirely composed of 14 candle power coal gas, and to that we add oil gas enough to restore the candle power to above 22 candles and enough water gas to carry the oil vapor through the superheater."

Before the cross-examination had proceeded very far, the whole calculation was in confusion; an entire page of the printed record is devoted to the difficult problem of dividing 10 cents by 10,600 feet in order to obtain the cents per 1,000 with results ranging from .094 of a cent to 9 cents, and the witness did not know whether his calculation was based upon a mixture of 225 cubic feet of oil gas and water gas with 775 cubic feet of coal gas or upon 225 feet of oil gas and water gas mixed with 1,000 feet of coal gas. It may seem incredible that, in a case of this character, the record should become burdened with such testimony and, while it makes interesting and amusing reading, someone must "pay the piper," and the heaviest share, unfortunately, more often than not, devolves upon the gas company.

To proceed, this witness—one hesitates to say expert witness—was given an extension of time in which to disentangle himself and finally produced the following as the cost of 1,000 cubic feet of 14 candle power coal gas for New York.

"Soft coal $3.20 per ton of 2,240 pounds.; average yield 5.2 cubic feet per pound—11,648 cubic feet per ton coal.

	Cents.
Cost for coal $\frac{3.20}{11,648}$ =	27.47
" " unloading $\frac{11.2}{11,648}$ per ton =	0.961
Cost for labor, gas making and purifying:	
Cost labor per ton .522	4.48
Cost supervision—superintendent and foreman	0.50
Cost repairs to apparatus—building	3.50
Cost purifying material—lime 56 cents per bushel —23,000 cubic feet per bushel	0.75
Cost purifying material—oxide	0.25
Cost oil and waste and sundries	0.37
Cost water	0.17
Cost general expense at works	0.50
	38.951

Less Residuals—
For 66 per cent. coke and breeze.....1,478.0 lbs.
Less 20 per cent. for firing retorts..... 295.6

1,182.4 lbs.

	Cents.	
Salable, at $4 per ton, 2,000 lbs. $\frac{2.3648}{11,648}$	20.31	
Tar 13.45 gallons at 5 cents	6.72	
Ammonia liquor, $\frac{56}{11,648}$	4.80	31.830
Cost		7.121

The above statement is given at length, not as an illustration of the acceptance of questionable data, though much might be said in this direction, but for another purpose. At present there seems to be a lull in the investigation craze that was so prevalent a few years past, neverthelss there is a tendency toward the spread of public service commissions, and it is more than possible that not a few of us may be called upon to meet testimony similar to, if not quite so outrageous, as that which has obtained heretofore. It may not be amiss, therefore, as opportunity offers, to call attention to the advantage of considering a proposition from every point of view, and at the same time, to present a striking illustration of the manner whereby conclusions based upon faulty data may often be shown to be practically absurd without the necessity of refuting in detail the data itself. Detailed refutation is sometimes difficult; time is likely to be limited and sources of information remote, and we find ourselves in sympathy with the saying that a "Lie travels round the world while Truth is lacing his boots."

Referring, then, to the above statement of cost per 1,000 for coal gas, and bringing together the cost given for coal and the return for residuals, we have:

	Cents.	
Cost for coal	27.47	
Cost for unloading	0.961	
		28.431 cents per 1,000
Less Residuals:		
Coke	20.31	
Tar	6.72	
Ammonia liquor	4.80	
	31.830	
Coal less Residuals a *Credit* of.....		3.399 cents per 1,000

As was well known, any credit for coal less residuals was something practically unheard of on the Atlantic Coast, to say nothing of a credit of nearly 3.40 cents per 1,000—as a witness for the company stated—under the then present conditions, it was a physical or financial impossibility, whichever way one cared to express it.

Qualification and definition are further matters to be considered in connection with the acceptance of data. Even carefully prepared and valuable records are at times far from self-explanatory.

Recall, for example, the case cited in a paper presented at the meeting of the New England Association of Gas Engineers (1907), with reference to a certain column headed "Capital per M. Sold, including Bonds," in an Annual Report of the Massachusetts Commission. It was found that in addition to Bonds, "Notes Payable" were also included, and, thus qualified, this statement of fixed capital was the means of showing that the working capital of certain Massachusetts companies, instead of being 13 cents per 1,000 of annual sales, as claimed by a witness in the New York Consolidated Gas Company case, was more than 3 1-3 times as great.

Having finally accepted properly verified data, and with a full understanding of its particular conditions and limitations, the knowledge that it is complete and sufficient for the purposes of its use is an additional requirement. Under certain circumstances, insufficiency leads to consequences quite as serious as those resulting from inaccuracy.

An engineering company of recognized standing, with many large and successful undertakings to its credit, was retained by certain capitalists to prepare estimates for a large hydro-electric development. All available records as to the stream were secured, surveys were started and the work of obtaining other accurate and necessary data was begun. The situation seemed full of promise, the financial interests were optimistic and impatient and the engineers, pressed for time, completed their estimates, basing them upon the incomplete information already in their possession. A company was organized, financial arrangements made to cover the estimated expenditure and construction work was commenced.

Briefly, the outcome was a receivership; the amount called for in the original estimate having been spent, it was estimated that something approaching 75 per cent. in addition would be required to complete the development. It is fair to say that not all of this excessive discrepancy was due to errors of estimate, a considerable loss being sustained by reason of division of responsibility for the construction work, a condition, by the way, to be studiously avoided if possible.

In the recent Fall River pressure case before the Board of Gas and Electric Light Commissioners, the petitioner was the Mayor of the City and the contention was that pressures in the mains had been so increased that consumers had been "obliged to use an amount of gas beyond their needs" and that, therefore, former reductions of price had been of little or no value to the consumers. The following is quoted from the decision of the Board: "The petitioner based his contention upon the following facts: In the seven years from 1898 to 1905—the years used for comparison by the petitioner—the annual sales had increased from 122,496,980 feet to 321,119,341 feet or 162 per cent.; that, in the meantime, the length of mains had increased 79 per cent., although the average diameter had been increased less than 7 per cent., 24.9 per cent. of the total length in both years being 6-inch mains or smaller; that the gas lost per mile of main had increased 96 per cent. between 1898 and 1904; and that, while the number of 3- and 5-light meters had increased from 47 per cent. of the total capacity to more than 96 per cent., the sales per meter light had increased 29 per cent. These facts were not disputed. Considered by themselves alone, they appear consistent with an increase of pressure; and if there were no other facts of greater importance, they might fairly lead to the conclusion that pressures had been substantially increased during the period named."

Here, then, we have another illustration of incomplete data, for it was shown, on the other hand, that during the period under consideration, the number of consumers had increased "from about 5,000 to 15,000, and the number of gas stoves installed from about 4,000 to upwards of 15,000"; and, furthermore, the average consumption per consumer was less in 1905 than in 1898. Upon these and other additional facts, which need not be cited here, the Commission very properly concluded that the complainant's contention was not sustained and dismissed the petition.

A most amusing instance of acceptance and interpretation of data occurred in the trial of the Cedar Rapids case not long ago. The evidence of a witness for the city, testifying in regard to leakage and the leaky condition of the holder in particular, is quoted as follows: "There were any quantity of white markings there, and I didn't care to touch a match to them * * * I never made a specialty of detecting leaks in holders, and don't know how gas men detect them. I know the holder is in bad shape."

As the Company was able to offer positive testimony that there were no leaks in the holder, and that the damaging evidence of

this "expert" in form of discolorations had been largely furnished by a flock of busy sparrows, the effect on the court can well be imagined. If carelessness is responsible in the matter of acceptance of data, then certainly it is to be condemned in the matter of interpretation. Interpretation displays either knowledge, ignorance or carelessness—it is here that right thinking is essential and "a little knowledge is a dangerous thing."

Most of you will probably remember the apt illustration of this given in the lecture on electrolysis before this Institute in 1907. Professor Ganz referred to a published report upon a water piping system where the total current between pipes and rails through ground is given as 6,148 amperes, resulting in a calculated destruction of 122,960 pounds of iron per year. The current was determined by measuring potential difference with a voltmeter and resistance with a ohmmeter between a point in the rails and a point in the pipes, and calculating the amperes from Ohm's law, the operation being repeated at a series of points and the sum of the currents given as the total current through the ground. Here we have an absurdity as the result of misinterpretation of data which in itself was very probably entirely correct. The fact that the result was absolutely without meaning was shown in view of the facts that "many times the current could have been obtained by making tests in a sufficient number of additional points in the system" and that the ground resistance "is the joint resistance of all conducting paths between the entire piping system and the entire rail system, while the potential difference is that between a point in the pipes and a point in the rails" the measurements as made "can therefore not be combined by Ohm's law to give current."

In connection with his discussion of this matter, Professor Ganz stated that the technical press had "already exposed and severely criticised some of these reports which have been published."

The technical press is a powerful agent in exposing numerous fallacies that are promulgated; in this and many other directions, it is a large and valuable factor in our economic development, and any consideration of the acceptance and interpretation of data would be incomplete were such a vast source of information overlooked. The technical journal in the ordinary performance of its functions is the vehicle for opinions and conclusions of individuals, for which it is not and cannot be expected to be responsible; it is not unusual, therefore, after having spent valuable time in the study of some article of contemporaneous interest to discover in the light of personal knowledge or analysis errors of fact or of interpretation tending to undermine the entire argument.

In January last, for instance, there appeared in one of the gas journals an article entitled "Per Capita Sales of Gas," in which we find it stated that—"From a population of 2,000 to 75,000 the sales per capita appear in most instances to depend almost entirely upon the price of gas, regardless of population. Above 75,000 the sales per capita appear to be decidedly dependent upon the population, increasing from an amount fixed by the density of population as the price of gas is lowered." Later the following statement and table appeared: While the increase of sales per capita appears to be about 50 cubic feet for each cent reduction of price in towns selling at from $1.25 to $1.00, it will be seen that the average increase in cities is about 40 cubic feet, although their average sales per capita is greater than in towns.

Massachusetts Towns.	1907 Sales Per Capita. c. f.	Sales Per Capita. and Date. Year.	c. f.	Difference. c. f.	Gain Due to Time. Years.	c. f.	Gain Due to Reduction. Cents.	c. f.	For One Cent. c. f.
Lynn	5,404	1903	3,616	1,788	4	960	15	828	55
Lowell	5,043	1901	3,352	1,691	6	1,440	6	251	43
Cambridge ...	5,465	1905	4,504	961	2	480	10	481	48
Springfield ...	4,209	1905	3,491	718	2	480	5	238	47
Fall River ...	3,957	1905	3,036	921	2	480	10	441	44
Worcester ...	3,853	1905	3,205	648	2	480	11	168	15
Lawrence	3,619	1906	3,229	390	1	240	4	150	33
New Bedford.	3,088	1905	2,233	855	2	480	11	375	34
Average .	4,330	....	....	....	.	....		Average,	40

In the statement just preceding the table, there is a differentiation between "towns" and "cities," and while the first column is headed "Massachusetts towns," no doubt the word "cities" is intended, these places having been purposely selected on account of the fact that they exceed 75,000 in population, with the possible exception of New Bedford, which is shown as approaching this figure very closely.

The data which forms the basis of the main argument is found in the Reports of the Massachusetts Board of Gas and Electric Light Commissioners, which are highly commended in the article for their clearness of statement.

Reference to these reports shows that in the above table the "1907 sales per capita" are derived by dividing the sales for the year ending June 30th, *1907*, by the population according to the census of *1905*, and further that the 1905 sales per capita, given in the fourth column of the table for Cambridge, Springfield, Fall River, Worcester and New Bedford, and the 1906 sales per capita for Lawrence, are also based upon the census of 1905. Hence for all of these six companies changes in population are entirely eliminated, a constant divisor being applied for 1905 and 1907 in each case, notwithstanding the statement quoted above that for cities of this size "the sales per capita appear to be decidedly dependent upon the population." In one case, the constant divisor is used, although the records clearly show that between the dates under consideration the Company had enlarged its territory.

Correction for this, and at least five other errors of omission or commission in the table, aside from the matter of constant population, results in at once reducing the average cubic feet for 1 cent from 40 to about 30. This 40 cubic feet increase of sales per capita for each one cent reduction is characterized in the article as nothing "more than a rudely approximate commercial quantity" and with this qualification we can almost agree, provided that the term "rudely approximate" is liberally interpreted.

In the column of the table headed "Gain Due to Time," it will be noted that a constant of 240 cubic feet has been multiplied in each case by the elapsed time. This constant of 240 cubic feet is the result of preceding tabulations, with reference to which the author says that he has "omitted the laborious computations of the above tabulations as requiring too much space, but as the method is stated they can be verified by anyone." A glance seems to indicate that again the sales for the year ending June 30th, 1907, have been combined with the 1905 populations, and in view of the errors already disclosed, one is scarcely encouraged to undertake the "laborious computations" referred to as necessary for verification, nor willing to accept the conclusion without verification.

In the January 15th issue of the journal referred to, there is an article entitled "London Sliding Scale for Gas," written by the author of "Per Capita Sales of Gas." After a statement as to English conditions and the "Utopian miracles" apparently wrought by the sliding scale in England, we come at length to the heading "General Theory of the Sliding Scale," under which there will be found a copy of some of the tabulations appearing in the former article and ending with the following formula "for the average total gain in sales resulting from a reduction in the price of gas and the lapse of time, in similarly situated cities." Similarly situated cities here refers to the eight cities covered in the table given above.

$$Z = \frac{(240 + 40r)\ y\ p}{1{,}000} \text{ in which}$$

Z = total increase of sales in thousands,
y = number of years considered,
p = population served,
r = reduction per 1,000 cubic feet in cents of price of gas.

The 240 cubic feet and 40 cubic feet are the two constants already discussed, but the qualification as to either being a "rudely approximate commercial quantity" is lacking.

The use for this formula is indicated in subsequent equations, which include the quantity Z; one of these, for instance, is called the "General Equation of the Sliding Scale" and is as follows:

$$\frac{(C + B)}{(S + Z)} \times \frac{(a + rx)}{100} = p - c - r, \text{ in which}$$

C = the total valuation of works or plant in cents.
B = total cost in cents of extensions or additions to capital required to meet increase of total sales, Z.
S = the total annual sales in thousands.
Z = total increase of sales in thousands, as before.
a = the agreed standard dividend (per cent.).
x = the per cent. increase of dividend for a reduction of one cent in price to divide equally the saving in cost of gas, or in the reduction of investment, per 1,000 cubic feet sold.
p = the standard (or initial) price of gas per 1,000 cubic feet in cents.
r = the reduction in price of gas per 1,000 cubic feet in cents.
c = the agreed cost of gas per 1,000 cubic feet delivered in cents.

Relative to this, the author says: "If in this equation, we place the condition that the reduction of price (r) to the consumer shall equal the increase of dividend * * we share the saving in cost of gas

equally." This equal division between producer and consumer is the basis of the author's sliding scale, which, in his language, "can be applied to every conceivable case because it embodies all the factors naturally operating upon the finances of gas works."

The particular case of the Boston Consolidated Gas Company is considered, values are assumed for (C + B), (S + Z), a, *p* and *c* in the above equation, and while the data assumed is inconsistent with the author's professed theories in some respects, and, in others, apparently is in need of modification, the difficulties are thus easily disposed of, so that *r*, the reduction in price, and *x*, the per cent. increase of dividend, are readily solved and a tabulation made satisfying in each case the condition of equal division. When, however, it comes to the practical application to "every conceivable case," it is by no means so easy to satisfy the equation, since such unknown quantities as the cost of gas, the total cost of extensions required to meet increase of total sales and the total increase of sales—the first two more or less dependent upon the last—must all be estimated in advance.

There is supplied the formula for determining the total increase of sales only, and this formula is decidedly limited as to scope by stipulation, and from what has been shown heretofore probably of little value in any event. It would rather seem, then, that the author's expressed hope that he has cleared up "this tangled situation, reaching an equitable and universal sliding scale" has hardly been realized.

Concluding the article, there is a prophecy to the effect that "the triumphant progress of the sliding scale in England will be repeated in America." In view of this, but more especially because of the manifest interest in the subject of the sliding scale at the present time, it may be appropriate and within the scope of this paper to briefly state the opinion of an English Barrister at the Parliamentary Bar, who is also a member of the Institution of Civil Engineers, a Director in six or eight gas companies, as well as some time engineer of one of the largest English Companies.

Comparing the advantages of the methods known as the "Maximum Price" and "Sliding Scale" respectively, this gentleman is all in favor of "Maximum Price with Auction Clauses" in preference to the "Sliding Scale," with reference to which he writes as follows:

"Like many superficially attractive ideas, the principle is bad in practice.

"The two most difficult things that a gas administrator has to do is,

(1) To add to the dividends of the proprietors,
(2) To reduce the price of gas to the consumers.

"Either one of these tasks is always onerous, and it is, therefore, from the writer's point of view, an ill-advised thing to make them synchronize, or, in other words, to ask the administrator to do two very difficult things at the same time. The effect in practice frequently is to defeat the object of the system by compelling the administration to refrain from either, because both parties to the arrangement have the right of simultaneously insisting upon their share of the benefit due to the operation.

"A second objection to the system is that it is always disturbing the current values of stock in the market by the continually changing rates of dividend, and those who buy stock at an enhanced price, due to a temporarily high dividend, are naturally dissatisfied when in the normal operation of the sliding scale the dividend falls and the value of the stock with it. Moreover, they cannot escape from the company excepting at a loss, until the stock has regained the enhanced value at which they bought it, and thus the marketable character of the stock is affected. It may sound childish, but it is true, that the normal conception of the investing public of any such scheme as the sliding scale is that their dividend is always going to increase under it, never diminish.

"A third objection, which, although the least apparent theoretically, is perhaps the most serious in practice, is that the attempt to comply with the dual exactions of the sliding scale has such a depletive effect upon the profits of the company that all expenditure is thrown upon capital, a large part of which should be drawn from revenue, and the investment in the company of surplus and undivided profits on which no interest is paid is stopped, and thus the most healthful financial process in gas administration is denied to those responsible for it.

"Fourthly, the only section of the proprietorate who could benefit largely or continuously under the sliding scale are the original proprietors, and when their holdings have once been placed on the market, they are brought down to the level of ordinary investments, but with the invidious addition of a speculative character, owing to the uncertainties of the sliding scale in its operation."

The above conclusions are worthy of consideration as being those of a man having an intimate personal knowledge of the subject and who has made a special study of gas law and gas works management. It has been sought to cover briefly in this paper some of the more important questions arising in connection with the acceptance and interpretation of data; if it be found of practical value to any, the effort will more than have been repaid, and although the discussion has been confined to matters relating particularly to our profession, it is hoped that the plea for careful work and right thinking may be accepted in a wider sense and liberally interpreted to the advantage of all.

The Chairman—We have but 10 minutes before our agreed time of adjournment, which will preclude discussion of this excellent paper. The thanks of the Association are due to Mr. Miller and Mr. Luqueer for their very interesting papers. The next on the program is the paper by Mr. Frank Hellen, of Rochester, N. Y., on—

A BOOSTER SYSTEM.

About a year ago the pressure conditions in the southwestern section of Rochester were such as to call for immediate attention, 14/10ths being the maximum pressure in the territory bounded on the north by West avenue and on the east by Caledonia avenue. The 10-inch line, which runs south on Caledonia, showed a main line drop of 25/10ths from West avenue to Plymouth avenue, a distance of 3,600 feet. Pressure readings taken on the 16-inch line at the junction of West avenue and Caledonia avenue showed 4 inches, the drop in pressure from the works to this point being exceedingly low, due to the fact that the feeders thereto consisting of one 16-inch and two 12-inch mains were of ample capacity.

In this situation there were two remedies to choose from, one being the extension of our 16-inch pumping line in Clarissa street, and under the bridge which spans the Genesee river at that point, and the installation of an exhauster at the works, which would pump the gas at a high pressure, involving an outlay of approximately $30,000. The alternative being the installation of a fan system so located as to enable us to pump from the West avenue mains into those in Caledonia avenue and Exchange street, the estimated cost of such a system being $3,000. As the congestion in the territory to be cared for was the result of rather a long period of years, and as there was nothing to indicate a recurrence of such conditions within a lesser period of time to come, it seemed to us that this $27,000 difference could be put to more fruitfulness than tying it up in an exhauster scheme. Therefore, we chose the less expensive remedy, believing satisfactory results would follow its use, and in this we were not disappointed.

A blower house, 13 feet by 22 feet, built of tile, was erected near the corner of West and Caledonia avenues. In this we installed a 40-H. P. electric motor and a No. 10 Sturtevant fan, the inlet of which we connected with the 16-inch main on West avenue, while the outlet was connected to 10-inch main on Caledonia avenue. We planned to pump from the 16-inch main on West avenue into the 10-inch main on Caledonia avenue, thence through the 10-inch main on Troup street, east, to Exchange street, thence south through the 10-inch main on Exchange street to Clarissa street, thence west through the 8-inch main on Bartlett street.

All small mains on the route of the new pumping lines were disconnected therefrom, and the services along the route connected to the 10-inch mains were equipped with house governors. A valve was placed on Exchange street line, just north of Troup street, to insure continuance in a southerly direction of the effect of the fan operation. The small mains in Greig street, also in Plymouth avenue, north of Clarissa street, are supplied from the new pumping line by means of valves. These valves are only a temporary expedient, and they will shortly be replaced by street regulators. Between November 10, 1908, and March 1, 1909, the average duration of pumping was three hours nightly. The pressure carried on the outlet of fan ranged anywhere from 10 inches to 20 inches. The maximum pressure obtained at Clarissa street during pumping hours was 8 inches, while throughout the territory where our low pressure troubles formerly existed we had no difficulty in maintaining a uniform pressure of 3 inches. The maximum hourly discharge in this territory was 70,000 feet.

In the immediate vicinity of the Clarissa street line we had some difficulty on account of excessive pressure, but this has been wiped out by the installation of the house governors. The total cost of this installation, including fan, motor, house governors, street connections and buildings, was $3,200.

Interest, depreciation, and taxes 10 per cent.....	$320
Rent of ground used for building.....	120
Cost of labor for pumping and incidentals.....	150
	$590

Interest, depreciation and taxes on installation of exhauster at works and extension of 16-inch pumping line would be $3,000. Thus we figured that we saved $2,140 the first year, taking as the estimated cost $30,000. In this you will notice that I did not figure electric current, as this would be offset by pumping expense at works.

The gas engineer who studies his system of mains realizes that an investment in additional main and equipment for boosting service pressure is there for 8,760 hours a year, and will probably be brought into its maximum use for only 250 hours a year. If he can get through a year or two with a booster plant, he is much safer in then determining just what main equipment he needs to reinforce his pressure.

In Rochester we have been particularly pleased to think we did not continue the 16-inch high pressure main into the booster district, for, since considering doing so, we have decided that we shall probably need a 3,000,000 foot holder, and if we should build one, it now looks as though it would be an outlying holder. In this event our present 16-inch high pressure mains will be ample for 10 years to come, and the investment that would have gone into the main will be in a storage holder, which is a very desirable place to have it. Briefly summing up we find—

1. Dollars and cents saved on installation.
2. We are not working in excessive high pressure. This means a decrease in leakage and maximum safety.
3. The advantage of making an installation that requires a moderate investment.
4. The large gas mains which were laid to the heart of the city, in order to insure an adequate supply thereto at the time when gas was used almost exclusively at that point, and which have long since outlived the conditions which compelled their installation, because of the encroachment of electricity in their particular field, and to which high pressure lines would probably never be connected, because no good purpose could thereby be served, are utilized by the booster system as a source of supply, and are, therefore, again a necessary part of our main system, and their value is nearly if not quite as great as when originally laid.

While we do not wish to maintain that our satisfaction with the booster system is to be regarded as final, we present the case in the hope that other members of the fraternity may be benefited by our experience. For those who need an outfit to relieve conditions similar to those we suffered from, and where the question of initial cost and subsequent operating cost is a serious one, we would recommend the booster system.

Resuming the Joint Meeting.

The Chairman—I do not intend to invite discussion on this paper, because our time has expired. We will now adjourn to meet in the main hall with the main body of the Institute.

At this point both sections met as a general meeting, and the President resumed the chair and asked for the

Report of Committee on Next Place of Meeting.

Mr. McKay—Mr. President, the committee considers favorably holding the next convention at Atlantic City, but requests a continuance, that it may confer with a like committee of the National Commercial Gas Association, with a view to holding the annual conventions of the two Associations at the same place during the same week. The committee desires authority to present, at a later date, a final report to the Directors of the Institute.

Wm. E. McKay,
J. D. Shattuck,
Frank W. Frueauff, } *Committee.*

On motion of Mr. McDonald the report of the Committee was concurred in.

The President—In this connection, I might say that the joint special committee of the Institute and the Commercial Association, appointed to consider the matter of some form of consolidation, is not at this time ready to make a final report, though substantial progress is being made.

It can fairly be claimed that this meeting has demonstrated that sectional meetings can be carried on successfully. This was a necessary step to a desired end. The joint committee has every reason to believe that a meeting can be arranged for next October, at a common meeting place, at the same time, possibly in sectional form, but in such form as will be satisfactory to both bodies.

A Resolution.

Mr. McDonald—If it is in order, I will carry out what I consider an instruction given to the Chairman by the meeting of the Commercial Section. That meeting has brought out the fact that a small assemblage of men, intensely interested in one subject, will bring out a fuller and more intimate discussion of that subject than will a much larger body of men of whom only a percentage are interested in it. The matter of dividing this Institute's meetings into sections, so that distribution men will not have to listen to purification papers, and vice versa, has been before the Directors for three years. They have hesitated to act upon it, because they did not definitely know the wishes of all the members of the Institute. The meeting down stairs, after discussing this matter, passed the following resolution:

"Resolved, That it is the sense of this meeting that the discussion of special topics on the part of those men who are especially interested in such topics is extremely desirable and profitable."

I report that resolution to the whole body for their dissent or approval, as they think best. The Directors of the Institute will be governed or influenced by the expression of the opinion of the Institute at large.

Mr. Searle—I move that they ask the approval of the American Gas Institute, as here assembled, by a rising vote, in that it seemed important to so do. [Seconded.]

The President—It has been moved and seconded that we have a rising vote as to whether, or not, in the opinion of the gentlemen here assembled, the sectional meeting feature has proved a success at this time. Those who believe that it has will please rise. [The meeting rises.] Those who believe otherwise will please rise. [No one arose.] There seems to be but one opinion, that it has been demonstrated to be a success.

Report of Committee on President's Address.

Mr. Jones—To the President and Members of the American Gas Institute: Your Committee appointed for the purpose of reviewing the address of the President, report as follows:

We commend the address for its strength, breadth and fairness of its treatment of subjects connected with the welfare of the gas industry. With reference to the generous contributions to the success of association work by representatives of the larger interests, we realize that this, of necessity, has been the case, and we hope that the invaluable work of these larger interests will continue unabated. We also hope that the other interests may emulate their example, and we strongly urge them to do so. We heartily endorse the recommendations that a committee be appointed to care for the interests of the Institute in its relation to commercialism, and that papers dealing with this important branch of our business be presented at each meeting. We also endorse the recommendation of the President, that it be the duty of the Public Relations Committee to secure for our programme papers dealing with this very important branch of our work.

We believe that the day has come when we must look to our commercial departments for constant substantial increase in gas consumption.

Respectfully submitted,

E. C. Jones,
A. M. Barnes,
C. C. Simpson, } *Committee.*

Naming of General Committees.

The President—There is due at this time the naming of the General Committees for the coming year. The following gentlemen have been appointed to serve:

Public Relations Committee.—Messrs. C. H. Nettleton, New Haven, Chairman; J. L. Richards, Boston; W. F. Hart, Washington; Donald McDonald, Louisville; R. C. Dawes, Chicago; J. T. Lynn, Detroit.

Technical Committee.—Messrs. W. Cullen Morris, New York, Chairman; A. H. Strecker, Newark; T. R. Beal, New York; W. H. Fulweiler, Philadelphia; J. N. Morehead, Chicago; G. E. Goodrow, Chicago.

VOTES OF THANKS.

Mr. Pratt—I feel I have had enough to do with arranging for meetings like this to appreciate fully the work done by the various committees in making a success of the same. Probably a great many members here have not had such experience, and, therefore, cannot fully appreciate the amount of work required in preparing for such a meeting. I always feel that I should like to take by the hand and thank personally any man who has assisted in any way in making these meetings a success. I, therefore, move, Mr. President that a vote of thanks be extended to the officers of this association, to the Committee of Arrangements, and to any gentleman who has had anything to do toward furthering the success of this meeting. [Seconded by several.]

The President—It has been moved and seconded that the thanks of the Institute be extended not only to the officers of the Institute and to the Committee of Arrangements, but to everyone who has helped in any way toward the success of the meeting. As many as are in favor of that motion will please rise. [The meeting rose.] Those opposed. It is a unanimous vote. We have now at our disposal some thirty minutes, if any gentleman has any business that he would like to bring before the meeting.

Mr. Dewey—I agree that a vote of thanks should be extended to all of the people who have been instrumental in making a success of this Detroit meeting, and I think we should extend our special thanks to the Engineers-in-charge of the work at the Livingstone Channel, which we shall visit to-morrow, and also to the Solvay Process Company, who are going to entertain us to-morrow. They have both gone to great expense, and are prepared to show us many interesting and instructive things. I therefore move that the thanks of the Institute be extended to the Engineers-in-charge of the work at the Livingstone Channel, and to the Solvay Process Company, for their invitations and the programme that they have prepared for us to-morrow. [Seconded.]

The President—It has been moved and seconded that the thanks of this body be extended to the Engineers of the Livingstone Channel and the Solvay Process Company, for their kindness and the work they have done toward making the entertainment portion of this meeting a success. As many as are in favor of that motion will signify it by rising. [The meeting rose.] Those opposed. It is a unanimous vote.

The meeting was then adjourned at 4:30 P. M.

WRINKLES PREPARED FOR THE FOURTH ANNUAL MEETING OF THE AMERICAN GAS INSTITUTE, OCTOBER, 1909, BY F. L. CROSS, EDITOR.

No. 1. *Use of an Economizer with Coal Gas Benches.*—An economizer of standard make placed on by-pass of the flue connection between the benches and the chimney does not reduce the draught appreciably, in fact, the damper is only slightly closed. The feed water used in the boilers is heated by the ordinary feed water heater to 180° and takes up another 100° in the economizer. The apparatus worked well, and will probably pay for itself in two years.—CHAS. F. PRITCHARD, Lynn, Mass.

No. 2. *Method of Scurfing Retorts.*—In connection with scurfing retorts, it is desirable that the surfing be accomplished rapidly and the temperature in the retort kept down at the same time. In connection with a recent patent for making CO, or carbon monoxide gas, by means of mixing limestone and carbon, it had occurred to me that, if limestone be thrown into the retort which it is desired to scurf, the following action will take place: The limestone begins to give off CO_2 at a reasonably low temperature. This CO_2, or part of it, on coming in contact with the carbon deposited in the retort will be reduced to CO. In that way the retort will be decarbonized. Inasmuch as the reduction of CO_2 to CO is an endothermic reaction, it will tend to keep down the temperature of the retort during the scurfing process. Care must be used not to carry this process too far, or it will take all the carbon out of the pores of the retort, causing it to leak badly until the pores are again filled up. CO_2 from any source could be used, and the process accelerated by air blast or other means. Naturally all due precaution must be observed during the handling of this process such as to prevent excessive circulation of air in retorts, etc.—WM. A. BAEHR, Chicago, Ill.

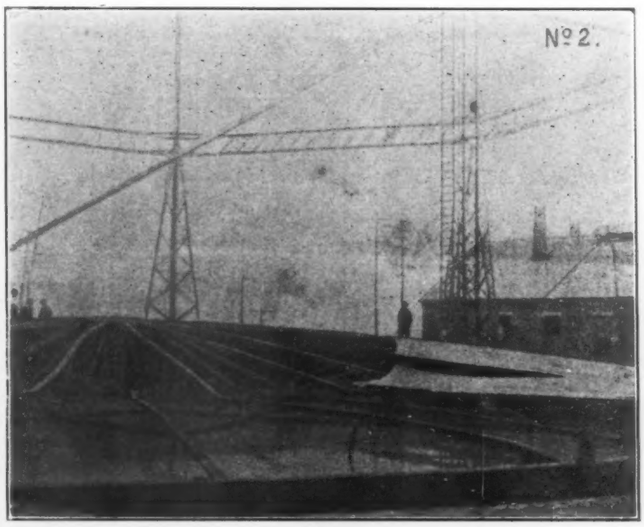
No. 3. *Removing an Old Gasholder.*—A 3-lift relief holder was removed to place a new one in the following way: The holder was landed and manholes in crown removed. An old exhauster was connected to the top of the standpipe on the outside of the tank, and air was blown in to flush out the gas remaining in the crown. The goosenecks on the outer section were removed and iron straps in the shape of an inverted stirrup were hung on the goosenecks of the middle section and bolted to the outer section, where the removed goosenecks had been. See Fig. 1, upper left-hand corner. Manhole covers were then replaced on crown and air pumped into holder until the required height above the tank coping was reached for convenience to the men who stood on the coping to do the work. Iron was then cut below grip channel and down each edge of vertical leg (Fig. 1 at A) and parallel with grip three sheets lower. Block and falls being hung from girder and guide frame, and attached to the sheet to be cut, with hooks, and landed when cut on coping, iron then to be hauled away. As the cutting progressed, the holder was raised, and after all the sheet iron had been removed from this section, the curb angle sheet was spiked to blocks of wood placed in the cup (see Fig. 2) opposite each tank roller, thus having the use of these to guide the other two sections when lowering (Note No. 1). The strap verticals were then cut off at the bottom from angle sheets, the holder lowered and cut loose from grip and hoisted out with block and falls. The grip (see Fig. 1, at B) was then removed, as well as straps and goosenecks of middle section. The inner section was then landed and the middle section hung to the inner section over goosenecks, and cutting off the iron on middle section proceeded as described for the outer section; the goosenecks and rollers on inner or top section and tank rollers of outer section guiding the holder. After the sheets had been removed from the middle section, the lower angle of outer section and cup of middle section were removed. The inner section was again lowered and held in place by four blocks-and-falls attached to frame work, just above first girders, and before landing, the grip was removed, belonging to the middle section. The inner section after landing was cut out in the tank (Note No. 2), the crown sheet being removed first, the side sheets next, then the trusses, curb angle of crown, verticals, and last the cup; all iron below tank curbing had to be hoisted out from the tank. The water in the tank was pumped out as work proceeded on inner section, rafts or swinging scaffolds being used to support the men. The cutting was done with pneumatic hammers and cutting tools (see Fig. 2), excepting extra heavy iron, angles, etc., on these we cut the rivets. A Westinghouse pump attached to a small receiver furnished the air, and the pipe was laid on curb from tank with air hose furnished the air to hammer in the ordinary way. The sections of the holder averaged 88 feet in diameter, and 25 feet in height, and 90 to 100 tons of iron were removed. The work required twenty-one days, using only two cutters and including cleaning out the tank. The results were satisfactory, as the holder had time to be thoroughly ventilated, as well as the tank with the air used to inflate the holder. There were no complaints from the men recorded at any time during the operation.

Note No. 1.—Figure 1 shows outside section hung on middle section with sheet iron removed; and grip channel vertical legs and angle sheets just above the tank level; and tank rollers attached to lower curb angle below tank level (not shown). Two men are holding pneumatic hammer.

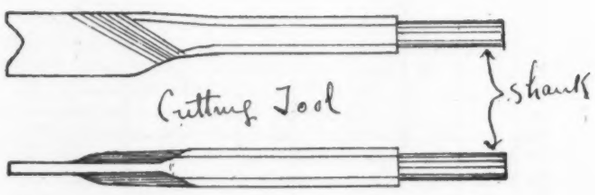
Note No. 2.—Figure 2 shows inner section landed and cutting off the iron of the crown with rafters and king post in place and water pumped out a few feet.—V. L. ELBERT, St. Paul Gas Light Co.

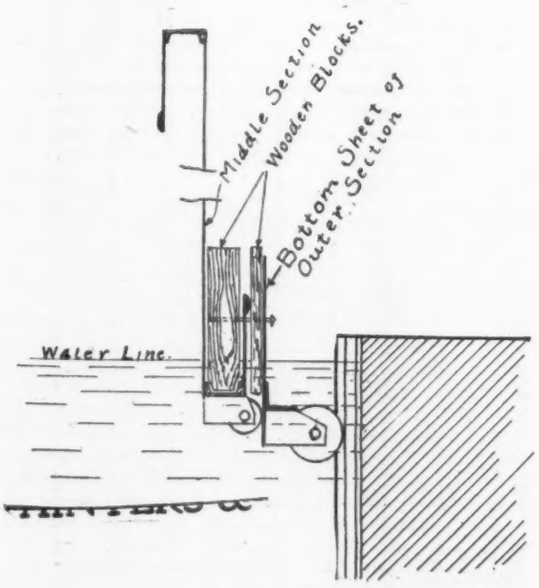
No. 4. *An Inexpensive Process of Water Infiltration.*—One of the sources of our gas works water supply is from a river nearby. Water being a rather scarce, and very necessary article, we are obliged to use water from the river. After passing it through our circulating system, we return it to the river. As we all know, circulating water in a gas works, after being used, carries more or less fine carbon particles, light tar, and dead oils. In order to return this water, after using it, to the river in clear and sparkling condition, we devised a system of seepage pits, consisting of a shallow basin dug on the river bank, in the sand, constructing in these basins a complete, bored, skimming system; our object being to free the water, after being used, of the fine carbon particles, light tar, dead oils, etc. We then diverted our river water overflowing from going directly into the river, so as to pass through this series of infiltration pits first, the sandy soil allowing seepage,

Wrinkle No. 3.—Fig. 1.

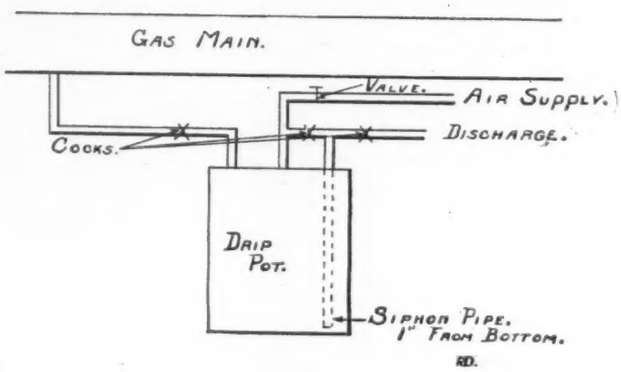


Wrinkle No. 3.—Fig. 2.

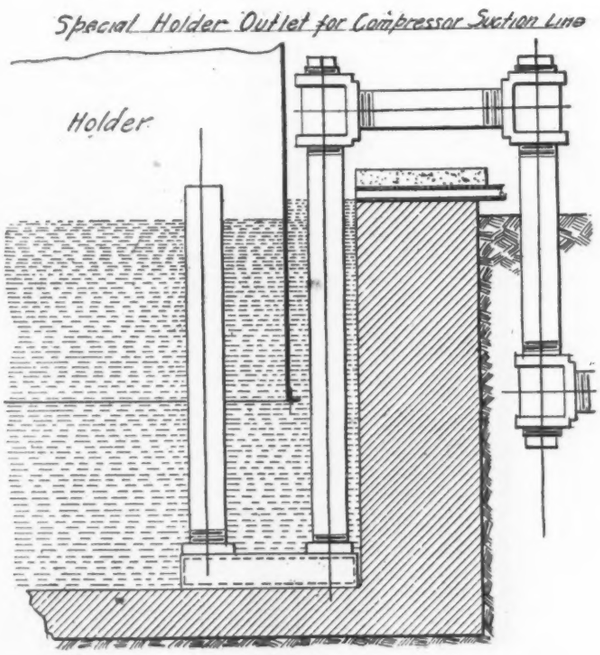




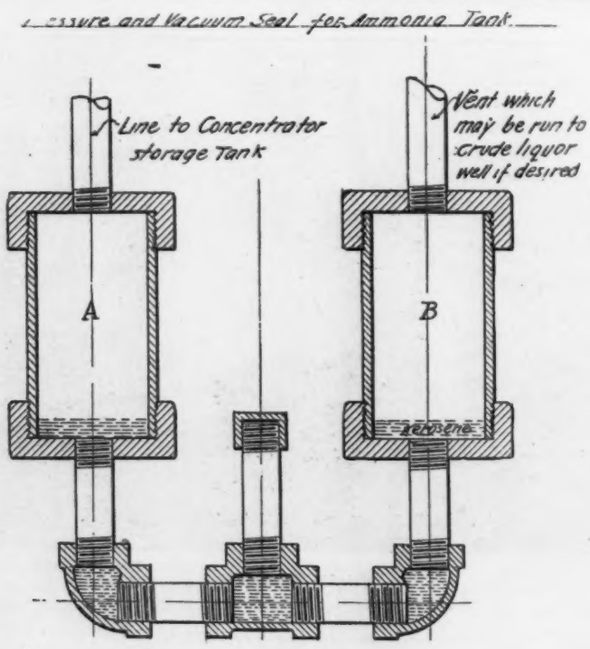
Wrinkle No. 3.—Fig. 3.



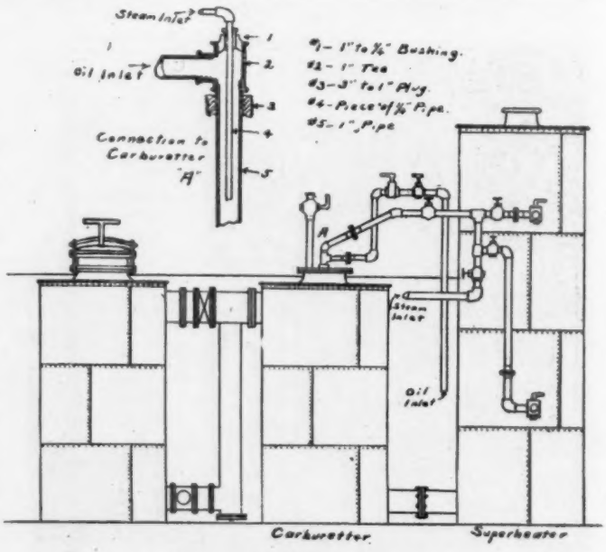
Wrinkle No. 6.



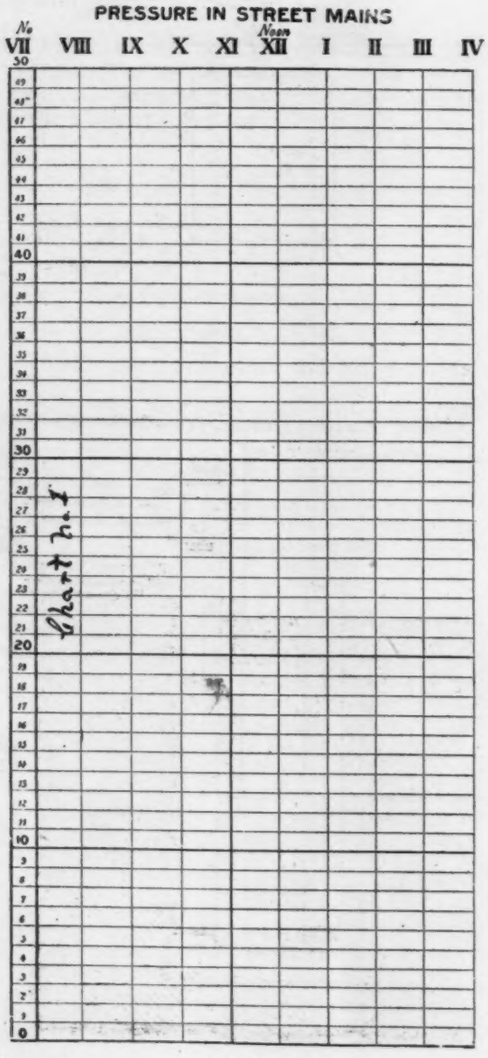
Wrinkle No. 7.


Pressure and Vacuum Seal for Ammonia Tank.
Line to Concentrator storage Tank
Vent which may be run to crude liquor well if desired
A
B
Kerosene

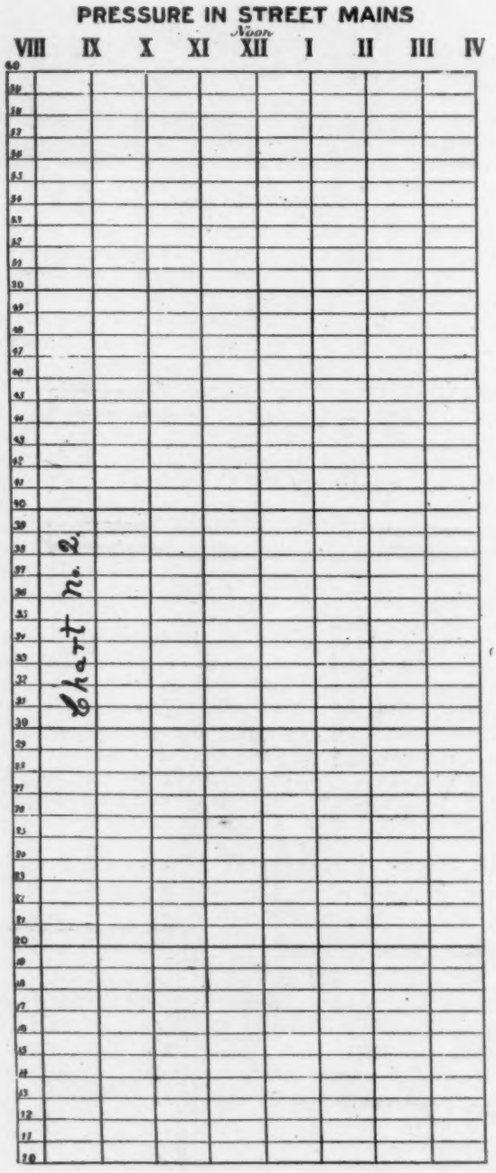
Wrinkle No. 8.



Wrinkle No. 9.



Wrinkle No. 14.



Wrinkle No. 14.

the skimming system holding any particles of foreign matter that might still be contained in the water. After constructing these basins and placing the board skimmers in place on the pits, we turn our overflow through with results that were more than satisfactory, and returned the water to the river perfectly free of any foreign matter, and clear and sparkling. We found that the water was materially reduced in temperature, so much so that we were enabled to use the overflow from these pits over and over again through our circulating system. The overflow water is contained in a flume and emptied into the suction pit of the river pump.—F. C. MILLARD, Los Angeles, Cal.

No. 5. *Meter for Registering Strokes of Pump.*—Take an ordinary Worthington oil meter dial and place it on the pump above the piston rod, far enough to one side so the arm on the piston rod will not strike it. On the arm of the piston rod place a cleat, so that a lever may be attached thereto, connecting the other end with the working arm of the meter dial (which the plunger ordinarily strikes), so that at every stroke of the piston the arm of the meter dial will be pushed just enough to catch a cog, thus turning the gallon hand on the dial one point at every stroke. If the readings of the meter are taken regularly, you can readily ascertain how many strokes were made during the 24 hours, and thence arrive at the strokes per hour or minute, just as you wish. The gallons of oil pumped may be obtained by finding how much oil is pumped at a stroke and multiplying by the number of strokes or, in case of a duplex pump, multiply by twice the number of strokes.—F. C. MILLARD, Supt., Gas. Mfg., Los Angeles Gas & Electric Co.

No. 6. *Arrangement for Pumping Drips Around Works.*—The sketch shows an arrangement for pumping drips around the works. While the pot is filling the air supply and discharge are shut and the pipe to the gas main is open. When it is desired to empty the drip pot, communication with the gas main is closed, the discharge is opened and air is admitted. When the drippage is discharged, the air is shut off, and remaining pressure being vented through the cock between the air line and the discharge line. Then the discharge is closed and the cock to the gas main opened. This arrangement is applicable, wherever compressed air is handy. It saves a great deal of time in pumping large drips.—A. F. TRAVER, Supt., Gas Dept., Denver (Colo.) Gas & Electric Co.

No. 7. *Special Holder Outlet.*—The special holder outlet was designed for the suction line to the compressor, supplying a high pressure belt line, as we found in taking this suction line out of the regular holder outlet that it cut the pressure to the street too much, it being only an 8-inch line. In a small plant you are taking too many chances of variations in quality of gas to feed a compressor from the holder inlet line.

This is all made up of standard 6-inch pipe and fittings, except the bottom of the U, which is a rectangular casting flat enough to clear the bottom curb of the holder when grounded, and of sufficiently larger sectional area to care for some drippage in addition to supplying the 6-inch pipes. The U was made up and lowered with a block-and-tackle from the guideframe and tipped sufficiently to turn under the curb when the holder was up to the blowing point, and after being placed was anchored with a couple of band irons in addition to the pipe connections into the ground. With the rigid connection at the top and the heavy foot casting, we find no perceptible tendency toward flotation. Both of these devices are in successful use at Adrian.—R. SHACKLETTE, Mgr., Adrian (Mich.) Gas Co.

No. 8. *Pressure and Vacuum Seal for Ammonia Tank.*—The pressure and vacuum seal for ammonia tank, which was designed as a cheap substitute for a pair of pressure and vacuum valves, can be made by any fitter from standard pipe fittings. This can be set on top of ammonia storage tank with the line to the receiver, A, connected to it, the other one venting to the atmosphere, as it is scarcely worth while to return it to the liquor well.

The receivers A and B must each be large enough to hold all of the kerosene or other fluid contained in the piping below the filling line, in the event of the pressure or vacuum being sufficient to break the seal. By increasing the length of the receivers A and B and the filler pipe, they can be made to carry any pressure and vacuum desired before breaking the seal.—R. SHACKLETTE, Mgr., Adrian (Mich.) Gas Co.

No. 9. *To Prevent Lampblack in the Take-off Pipe in a Water Gas Machine.*—The accompanying sketch shows a method we have used to overcome the making of lampblack, and which also, we think, has slightly increased the make per run. We have had this in use over two years, and have had no trouble with the drip-pipe in the wash-box, or with the take-off pipe stopping up with lampblack.

There is a steam connection in the top of the carburetter, through which we turn the steam on ½ minute before the oil is turned on to reduce the extreme heat in the top of the carburetter. The oil is then turned on and the steam used to spray the oil. At the same time a little steam is turned in the lower sight-cock of the superheater and left on during the entire run. While blowing up on the last run of the day we use steam for two minutes in the upper and lower sight-cocks of the superheater, to keep the checker-brick clean.—CHAS. A. ROBERTS, JOHN MCDONALD, New London, (Conn.) Gas & Electric Co.

No. 10. *Automatic Control for Water Gas Exhauster.*—This consists of a butterfly valve, in the steam line to exhauster engine, placed about 4 feet above the globe valve on steam line. To handle this butterfly valve a steel wire, run on suitable pulleys, leads to the fastenings on top of the relief holder, the wire being so arranged that when the relief holder is down to a certain point, the butterfly valve is closed, shutting off the exhauster. This arrangement was used at a water gas plant to prevent the relief holder crown from being drawn in.—E. C. WHITE, Western Gas Construction Co., Fort Wayne, Ind.

No. 11. *Filtering Tar for Burning under Boilers.*—By passing the tar through 16 thicknesses of wire cloth, having a No. 14 mesh, made of No. 20 wire, we have eliminated all particles of ash and lampblack from the tar which would stop up the burners. We then spray the tar into the fire-box by means of a steam-jet tar burner. We have found that tar burned in this manner is more valuable as boiler fuel than crude oil. We pump our tar through a pipe, which reaches to within 6 inches of the bottom of the relief holder (used as a storage tank), and on the bottom of this pipe a flange is screwed so that we always get the heaviest tar and the tar with the least amount of water in it. By filtering the tar as above we find that we can burn it satisfactorily, even though it does contain a high percentage of water.—M. J. DEWEY, San Antonio (Tex.) Gas Co.

No. 12. *Naphthaline Washer.*—Water gas made from Indian Territory oil contains considerable naphthaline. In order to determine if we might use this crude oil to wash the gas, we made the following laboratory experiments:

Determined that crude Indian Territory specific gravity 28° B., sulphur 26 per cent. will absorb about twice as much naphthaline as water gas tar made from the same oil. Determined that hydrogen passed through the oil collected 12 to 28 grains of organic sulphur per 100 feet, but did not collect any H_2S. Determined that water gas containing 40 to 50 grains of organic sulphur on being passed through the oil loses about 25 per cent. of its organic sulphur, and collects no H_2S., we have, therefore, concluded to use oil for washing our gas.

A naphthaline washer, using crude Indian Territory oil is now in use in Galveston, Texas, and is giving good results.—A. H. CALKINS, L. B. MOOREHOUSE.

No. 13. *Method of Determining Depth of Oil on Top of Holder Tanks.*—With holder close to blowing point, lower thief into water, turn glass end in under the shell; then very slowly raise thief, keeping it plumb, until top of glass is above inside water level; close cock by means of rod, close inside end by pulling on cord, and remove thief. Depth of oil will be shown on water in glass.—S. K. CAMPBELL, Genl. Supt., Nassau & Suffolk Lighting Co., Hempstead, N. Y.

No. 14. *Increasing Record on Recording Pressure Register.*—Having in use a recording pressure register used for registering pressure on city mains at the gas works, the height of holder or float being about 18 inches and diameter 12 inches, registered up to 50/10ths pressure, as per chart spaced and marked No. 1, and wishing to record a higher pressure on the same spacing of sheet, I placed a lead weight on top of the holder or float (the quantity must be determined by trial) until the proper weight of metal produced the desired range and then changed the scale reading on chart to suit.

Chart No. 1 records from 0 inch to 5 inches pressure.

Chart No. 2 after weighing float records from 1 inch to 6 inches pressure.

As our minimum pressure is not less than 2 inches, the 1 inch loss on chart at bottom is of no use as a record, and is added at top of sheet as stated. Any recording pressure register can be altered in this way to record pressure desired, and save purchasing a new one.—V. E. ELBERT, Supt., St. Paul (Minn.) Gas Light Company.

No. 15. *Placing Landing Blocks Under an Old Gas Holder.*—Wishing to raise the inside section of an old gas holder to place 16 new landing stones, as well as raise center pier an equal height, holder having been let down to place in a larger and additional inlet pipe, I adopted the following way:

The holder and tank had been thoroughly ventilated, and after work had been completed on the new inlet pipe, water to the depth of one foot was run into the tank. Three men entered through the manhole, and a manhole cover of wood, with a heavy light of glass, was placed on the opening and bolted down in place of the regular manhole cover. A ¾-inch hose was connected to the crown sheet on the under side, to a ¾-inch pipe nipple through the sheet, and a hose with a valve attached to the same nipple on the outside of the crown sheet, which answered as a speaking tube which communicated with the men inside. Air was then pumped into the holder with a small plunger air pump, connected to a 3-inch flange to the crown of the holder, and when the holder was at proper height the landing stones were placed on beds of dry concrete mortar and leveled from the water level in the pit. The glass in manhole furnished enough light to get around in the pit, electric flashings being used to furnish light to do the work. The job was all completed in 3½ hours from the time the men entered to their exit from the holder, with no evil effects whatever. The glass cover could have been broken for the quick release of the men had they so desired.—V. L. ELBERT, Supt., St. Paul (Minn.) Gas Light Co.

No. 16. *Pressure Alarm.*—The accompanying sketch shows a maximum and minimum pressure indicator, the device being a modification of the ordinary pressure gauge in which the bottom block (B) is made of steel and insulated from the top head by means of a fiber plug (G) and a ring (F). The wire of a 110-volt circuit is run in at (H) and taken off at (I). The circuit carrying red lamps is completed by the German wire (a) coming in contact with the mercury at (C) and (D) when the pressure exceeds a fixed maximum or falls below a fixed minimum. Thumb screws (E) and (E) allow adjustability. This device should be tested for adjustment from time to time.—L. B. MOOREHOUSE, Supt., Gas Dept., San Antonio (Texas) Gas & Electric Co.

No. 17. *Unique Use for Two Small Gas Engines.*—We have two small gas engines on which we have reversed the valves and belted to our exhausters for revivifiers. These we belted from the flywheel of the gas engine to the coupling between the engine and exhauster, making a very satisfactory air pump. We also used these same appliances in removing dust from our apparatus around the electric station, pumping into a receiver, storing the air, and using as needed.—THOS. CRAWFORD, Genl. Mgr., Clinton (Iowa) Gas Light & Coke Co.

No. 18. *Use of Pneumatic Hammers for Caulking Gas Mains.*—We have been using a portable plant this summer for the purpose of supplying air to the pneumatic hammers with which we have been caulking lead joints in the ditch while laying 16-inch and 24-inch pipe. The same plant is used also for putting 5 pounds pressure on the line after the joints are made up, for the purpose of testing. The plant consists of a small vertical boiler, on wheels, with a pressure tank in front, and a compressor of standard make attached to the boiler. The plant is large enough to handle two pneumatic hammers successfully at 80 pounds pressure, and has been a great saving to us in labor, as one man can easily do with the pneumatic hammer as much as six can do by hand, and do the work better.—D. F. BURRITT, Supt., Springfield (Mass.) Gas Light Co.

No. 19. *Measuring Funnel.*—In the operation of a plant it is very necessary for the foreman to know exactly how much water he is running into rotary scrubber washers, etc. In order that he may accomplish this with the least trouble a measuring funnel is placed as shown in the accompanying sketch. To operate, close the cock and note the length of time until the funnel overflows. The capacity of the funnel being known, the foreman knows at once whether the supply is all right.—DETROIT CITY GAS CO.

No. 20. *Capped Steam Valves.*—Around gas works, where steam lines are run long distances, it is troublesome to keep the valves which are often very little used from leaking steam and water around the stuffing boxes. For valves not frequently used the following remedy has been applied. A stuffing box nut (same as used on lock and shield valves) is threaded on the end and a cap screwed on as shown in the sketch.—DETROIT CITY GAS CO.

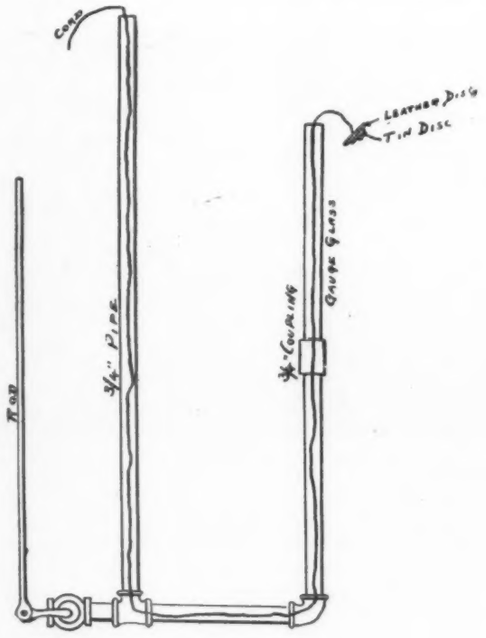
No. 21. *Dumping Bucket for Putting Water into a Scrubber.*—For a long time we used flushing tanks for this purpose, but when the amount of water to be put in was cut down low, the flushing tank would fail to siphon and required constant watching. The present dumping bucket is very positive in its action. The device is described as follows:

It consists of a box, diamond-shaped on the side, and wide enough to contain the amount of water desired, turning on a trunnion "D," and caught by the rubber cushion "I" and "J." "A," "B," "C" and "D" represent the box. In our case it holds 5 gallons. "D" is the trunnion on which it turns. "W" is a weight made of lead washers, which is adjusted so as to bring the box back to position as soon as it is empty of water. The trunnion "D" is placed at such a point that the box will overbalance a little before it becomes full of water. This is important, as otherwise, if the box becomes full and runs over, water will run into it without dumping it. "G" is a tank which receives the water and from which it falls into the scrubber. "H" is a small pipe which catches a thimbleful of water at each dump and leads it down to a convenient point of observation. As long as water is dropping from the pipe "H," the foreman knows that the device is working. It is manifest, on inspecting the diagram, that when the box is empty it will remain in an upright position. When it is nearly full, it will overbalance and empty itself completely, and as soon as it is empty, it will resume the first position. The box is made long and low and wide, so that the shock of dumping and recovering will not hammer it to pieces. I know that dumping buckets have been used for a long time, and we have tried several different shapes. This one has proved absolutely reliable and more durable than any of the others.—DONALD MCDONALD, Prest., Kentucky Heating Co., Louisville, Ky.

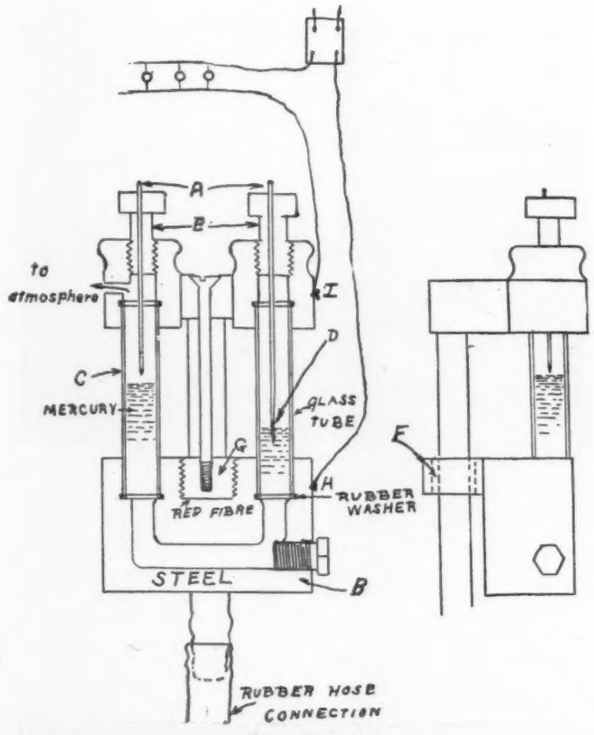
No. 22. *Machine for Tapping Gas Mains under Pressure.*—Along our high pressure mains a great many new streets have been laid out recently, and to put in fitting for these streets meant cutting the line and by-passing the gas, all of which had to be done at night with holder pressure. The tapping machines at present on the market were all too cumbersome and expensive and took up too much space, consequently I had the machine made shown in the accompanying cut, and it works most satisfactorily. With this machine we can tap 4-, 6- and 8-inch, and it can be used in a ditch 36 by 24, at any angle and without pressure. When the main is tapped the valve is in place ready for the extension and without any loss of gas or the men getting any gas. To put on sleeve and get ready to tap requires about 2 hours, while the actual tapping requires about 30 minutes. The sleeve can be used either as a tee or cross. When the sleeve is used as a cross, we run the joints solid with lead. The machine consists of the following parts:

A split sleeve (1) to be put around the main to be tapped, out of the side of which is an opening (2) into which a short nipple (3) is screwed. Onto nipple (3) is screwed a standard full-way gate (4) and into gate (4) is screwed a long nipple (5) which is of a length sufficient to enclose the tapping tools (6) when same are pulled back to clear gate. Nipple (3), gate (4), and nipple (5) are standard, full-sized fittings of a size of the pipe to be connected to the main. Onto nipple (5) is screwed a head (7) in which is a stuffing box (8) which, by use of packing (9), makes a gas-tight joint around the stem (10) of the tapping tool. On the end of the stem (10) is a ratchet (11) and pressure is furnished the tool by means of a screw (12) in crow's foot (13). The operation of the machine is as follows:

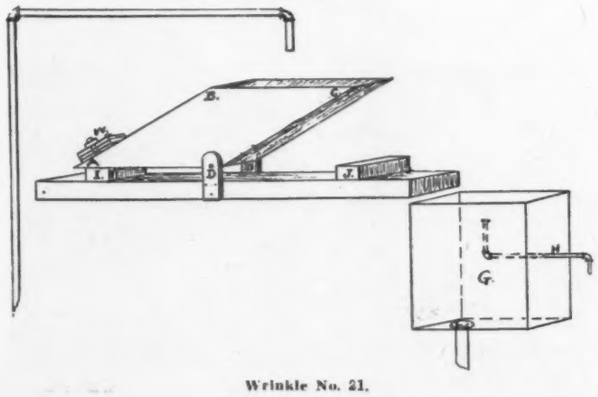
Sleeve (1) is placed around the main at the point to be tapped exposing through the opening (2) the point on the main to be tapped. The sleeve is leaded and caulked, making a gas-tight fitting. Nipple (3), gate (4), nipple (5), head (7), and tool (6) are placed in position, as in Fig. 2, gate (4) being left open. By means of screw (12) pressure is given to tool (6), so that drill (14) engages the side of the main, and a hole is drilled. Then



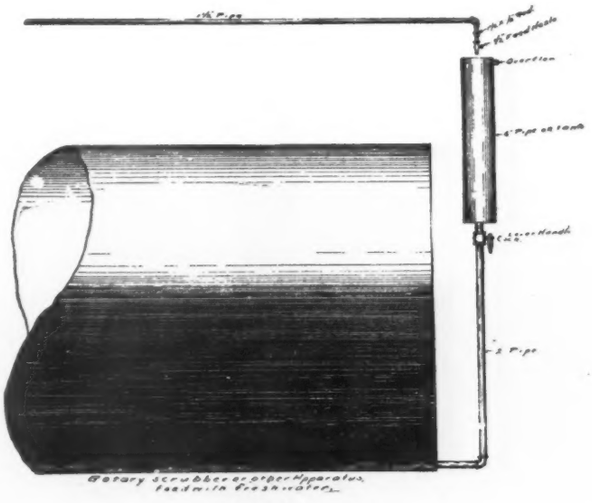
Wrinkle No. 13.



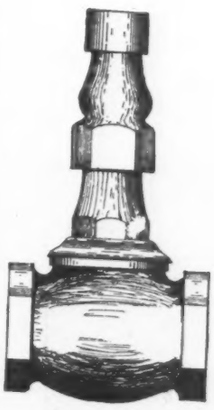
Wrinkle No. 16.



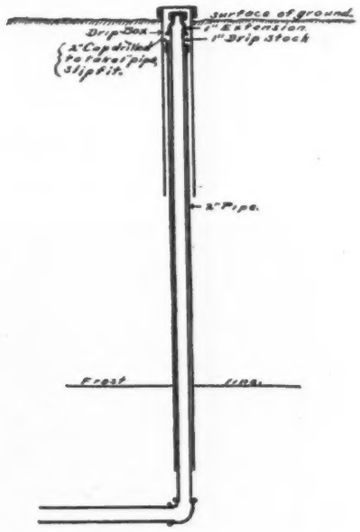
Wrinkle No. 21.



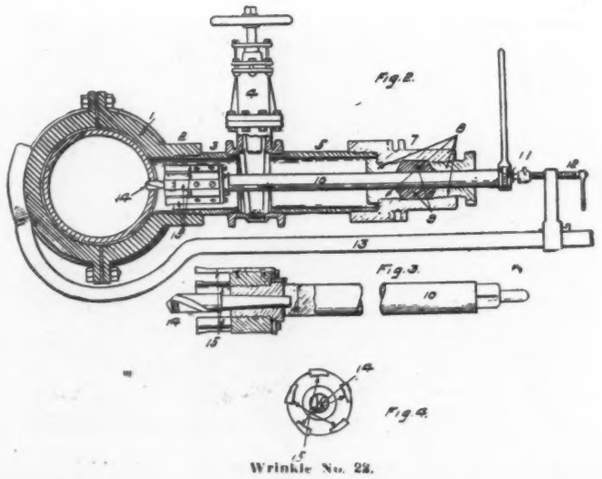
Wrinkle No. 19.



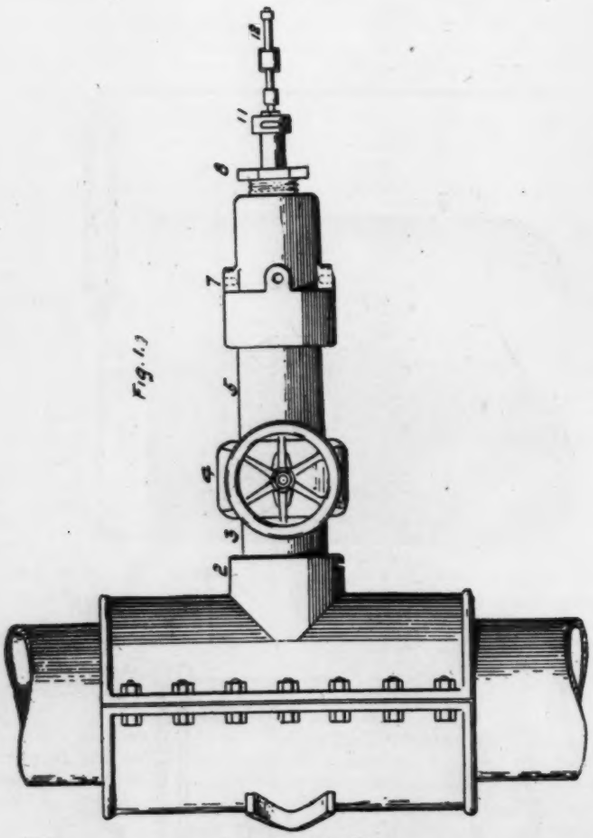
Wrinkle No. 20.



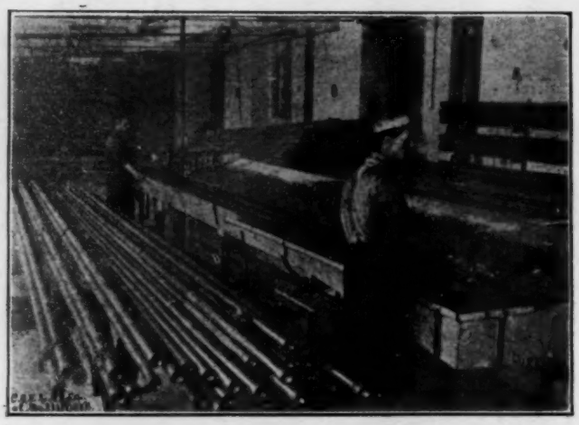
Wrinkle No. 24.



Wrinkle No. 22.

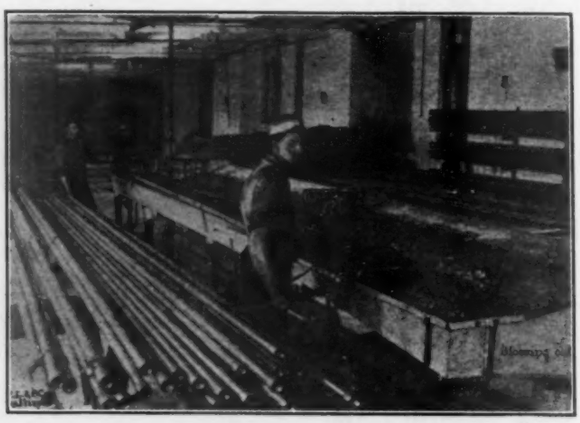


Wrinkle No. 22.

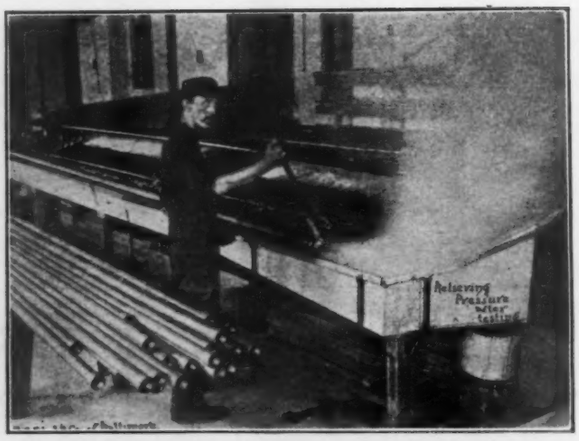


Wrinkle No. 26.—Fig. 1.

Wrinkle No. 26.—Fig. 2.



Wrinkle No. 26.—Fig. 3.



Wrinkle No. 26.—Fig. 4.

Wrinkle No. 26.—Fig. 5.

the knives (15) engage the main and cut a plug out of the side of the pipe. When the first opening is made in the main the nipples (3) and (5) are filled with gas, but by nature of the gas-tight joint, no gas escapes. When the plug is cut out of the main the tool is pulled back into the nipple (5), which brings with it the plug cut out of the main by means of the thread on the end of the drill (14). See Fig. 3. When the tool is withdrawn into the nipple (5), the gate (4) is then shut and nipple (5) is unscrewed from gate (4), leaving gate ready for connecting pipe. Figs. 3 and 4 show details of tapping tools.—W. J. Dorr, Supt., Gas Dist., Los Angeles (Cal.) Gas & Electric Co.

No. 23. *Socket Wrench.*—A socket wrench for removing ½-inch and ¾-inch plugs from the bottom of risers. In old work it frequently occurs that a number of risers will drop so close together that it is impossible to get an ordinary wrench on the individual plugs in order to remove them.—W. K. Harrington, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 24. *Method of Protecting Drip Stocks.*—The method shown in the accompanying sketch was adopted in order to prevent the frost breaking off drip stocks due to the upheaval of the frozen earth crust, a trouble which is experienced to some considerable extent in Detroit. The protection consists of a 2-inch pipe sheath placed around the 1-inch drip stock. The lower end of the 2-inch pipe is below the frost line, and is open, allowing any surface water which may leak in at the top to drain away. The upper end is capped with a 2-inch cap having a hole in the center just large enough to allow the 1-inch drip stock to slip through easily, but not allow the dirt to work in between the stock and the sheath. A special male-female coupling is placed on the end of the stock in order that the drip pumper can easily replace same if the thread becomes marred by screwing on or off the cap.—Detroit City Gas Company.

No. 25. *Solid Pipe Plug.*—A special roundhead plug to be used in tees at the bottom of risers or at the heads of services. It is frequently difficult to remove the ordinary plug with the small square head, as the edges of this head frequently become so worn that it is impossible for the wrench to get a grip. With the special roundhead plug this difficulty is eliminated and the plug is always readily removed.—W. K. Harrington, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 26. *Coating Service Pipes.*—The operation of coating the pipe also carried with it the clearing out the pipe of any scale or other material and also testing it for leaks. The complete process is as follows:

The pipe is first scraped with wire brushes, then rubbed off with a piece of burlap; then it is lifted to the coating trough and one end pushed over a nipple, having around it a soft washer to make it steam tight. Steam is then blown through it into the drainage department alongside of the trough; then a lever with soft washer attached to it is pushed over the open end of the pipe, the lever being held in place by a projection on its lower end, which fits into one of the holes in the wrought iron plate shown in the picture. There are a sufficient number of holes in this plate to accommodate the varying lengths of pipe. Steam under 80 lbs. pressure is again turned into the pipe long enough to see that it is tight, after which the pressure is relieved at a stopcock on the end of the pipe next to the steam valve. The pipe is then lifted by two wooden handles, which are cupped out sufficiently to cover the threads on the ends of the pipe, and, after dipping, the pipe is placed on a drainboard above the trough, and all superfluous tar is taken off by running a scraper gently over the pipe from one end to the other. The whole operation of cleaning out, testing and dipping a length of pipe, does not occupy more than about two minutes. For the coating mixture we are using what is known as the "Cincinnati Mixture." Our practice is to wrap all service pipes with muslin after they are laid, the wrapped pipe being then painted with a mixture of coal tar with a sufficient quantity of water gas tar to keep it thin in cool weather.—Geo. Beadenkopf, Engineer, Consolidated Gas, Electric Light & Power Co., Baltimore.

No. 27. *The Lynn Main Cart.*—In our experience with main laying, we found one difficulty to be the moving of the tool box. It required six men to move the same and the loss of some little time, as the tools had to be taken from the box first, the box carried ahead, then the tools carried ahead and replaced in the box, so we decided to build a box on wheels, of which the following is a description: It consists of a 4-wheel cart, 1½-inch axle, with frame 9 feet long by 3 feet 6 inches wide by 3 feet 2 inches high, with pitched top. In the rear is a vertical partition 2 feet back from the end, which gives a place for lanterns, fittings, die stocks and other small tools, with a vise attached to the side of same for pipe threading. Another partition 2 feet 4 inches from the bottom runs horizontally, in which are stored picks, shovels, bars, and all tools of that nature, it having a side door which turns down. In the top part one side of the pitched top is hinged to the middle and turns up, which gives storage for small tools. The front wheels are 32 inches in diameter and set 2 feet out from the cart on an iron tongue, which allows them to turn in a short radius, there being a handle attached, which may be attached to a team for hauling. The rear wheels are 36 inches in diameter. We find this cart will take care of tools for about 25 men.—Chas. F. Prichard, Vice-Pres. & Genl. Mgr., Lynn (Mass.) Gas & Electric Co.

No. 28. *The Lynn Service Cart.*—Having found that a great deal of time was wasted by the men in going to the shop for fittings and tools which were needed, we had built a tool cart with the following description, which we have been using now for about 15 years: The cart is a two-wheel, drop axle push type. The axle is 1½-inch, with a drop of 8½ inches, which brings the body near the ground. The wheels are 44 inches in diameter with 2-inch fellies. The body is 5 feet 6 inches long by 2 feet 9 inches wide by 1 foot 11 inches high. The frame is of ash, well mortised, with a center rail extending 3 feet 4 inches beyond the body, with an end bar which makes the handle. The cross bar of handle has an iron staple which is attached to the teams for hauling when the distance is too great for the men. The cover of the cart is hinged at 4 feet 6 inches from the back end and turns up and over on the front bar of the cart, the handle being supported by an iron stud, which is attached to the cover, and raises on front bar. The cart is supplied with picks, shovels, bars, die stocks, fittings, and all tools used for general service and repair work. The vise is attached to the middle-back crossbar of cart, which is 4 inches by 5 inches. The vise is set on an angle, so that when the cart is tipped down in front and the foot irons placed in rear, the vise and the cover are in line, so that the pipe may be placed in the vise and threaded. In the top of the cart is a box or drawer, which slides from one end to the other, in which are kept all small tools and fittings.—Chas. F. Prichard, Lynn, Mass.

No. 29. *Right and Left-hand Cock for Range.*—A special range cock, made with right and left threads, the use of which obviates the necessity of using a union, long-thread, or right and left coupling.—W. K. Harrington, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 30. *Method of Using the Cooling Water of a Gas Engine in the Hot Water System of an Office Building.*—The accompanying sketch shows a 125-H. P. gas engine combined with a hot-water storage system in such a way that all, or a part, of the cooling water from the engine is utilized in the hot water tank supplying an 8-story office building. The system is made up as follows:

The city water pressure not being great enough, the water supply is first pumped into a storage tank in the attic. This head supplies all the water used in the building. The cooling water taken from this tank passes through the engine into a branched pipe, one arm of which leads through a thermostatic controlled valve to the sewer, and the other leads through a centrifugal pump to the hot water storage tank. This is connected with an instantaneous gas water heater and with the circulating system of piping as ordinarily used in office buildings. According to the well-known principle, the centrifugal pump, running at a constant speed, supplies a constant head of water at its outlet, within the limits of its capacity. The pressure, therefore, on the hot-water tank does not vary appreciably, although the volume of water passing through it varies from zero to the maximum amount used in the building. In order that a constant temperature may be held on the engine, a standard make of thermostat is placed in the outlet line and operates the diaphragm valve in such a manner that more or less water passes to the sewer, according to the temperature. With this combination, the hot water system is supplied with the variable amounts of hot water required at a temperature of about 140° F., while the thermostat at the same time is enabled to hold a constant temperature on the engine. The gas heater, as shown, automatically raises the temperature of the water to 150° F., the amount required. The system is so connected up with check valves that if the water

supply in the cold water storage tank gave out, the city water would furnish water for the engine.—Detroit City Gas Company.

No. 31. *Special Reducing Meter Cock.*—A 3-light meter screw is for ⅜-inch pipe, whereas the meter is connected up with ½-inch pipe and in the same way a 5-light meter screw is for ½-inch pipe and is connected up with ¾-inch pipe, but in making the reducing cock from ½-inch to ⅜-inch and from ¾-inch to ½-inch, it does away with the reducing fittings.—W. K. Harrington, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 32. *Method of Repairing Old Meter Cases.*—Very satisfactory results have been obtained by shellacing a piece of diaphragm leather and sticking it to the sides, bottom and top of the inside of old meters, where the tin has worn off, leaving a rusty iron surface exposed, which rough surface tends to cut the leather of the diaphragm.—James Daly, Foreman Meter Shop, New Orleans (La.) Gas Light Co.

No. 33. *Melting Rims off Meter Disks.*—For melting rims off disks, a cast-iron skillet placed over a hot plate and an iron ring, somewhat smaller than the diameter of the disk is placed in the bottom of the skillet and enough solder melted in the skillet to nearly reach the top of the ring. A disk placed over this ring will have its band removed almost instantly. A small boy can operate it, so that a thousand or more disks per day can be cleared of the old bands easily.—James Daly, Foreman, Meter Shop, New Orleans (La.) Gas Light Co.

No. 34. *Hose Clamp.*—A simple form of strap to be used on tubing in fixing the same to a hose cock or an appliance.—W. K. Harrington, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 35. *Male and Female Reducing Tee.*—A special ⅜-inch by ½-inch right-and-left reducing tee to be used on ceiling drops in connecting up small gas appliances. The accompanying sketch explains same.—W. K. Harrington, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 36. *Safety "U" Gauge.*—While considering the advisability of placing "U" water gauges in the homes of a large number of our employees in order that they could watch the pressure conditions and report on same, the need of a safety gauge, in which the water could not evaporate or blow out, became apparent. The attached sketch shows a home-made gauge with an ordinary bicycle valve soldered in the vent on the low pressure side. To read the gauge, the cap is unscrewed and the valve held open with the finger until the reading can be made. The entire gauge, as shown, can be made up for about 70 cents.—Detroit City Gas Co.

No. 37. *An Arrangement of Roof Lights.*—Mr. J. C. Ross, of the Utah Gas & Coke Co., contributes the accompanying photographs, showing a method of suspending lights over the edge of flat-roof buildings. The position of the lights can be changed and are readily accessible for maintenance when they are drawn back over the roof. Means are provided for lighting the arcs in position.

No. 38. *Safety Drip.*—A drip which may be emptied in safety in dark places. A cock is placed in the drip, so that when it becomes necessary to empty the drip, the cock is shut and the plug removed from the bottom. This avoids the danger of a sudden flow of gas in case the plug at the bottom should fall out or be dropped and enables the fitter to readily stop the flow of condensation or gas in case of trouble.—W. K. Harrington, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 39. *Clamp for Adjusting Meter Valve.*—An ordinary paper clamp or spring clothes pin can be quickly inserted, wedging the crank shaft, so that the tangent arm can be changed with ease, as shown in the cut.—James Daly, Foreman, Meter Shop, New Orleans (La.) Gas Light Co.

No. 40. *An Adjustable Meter Connection.*—The accompanying sketch shows an adjustable meter connection, to be used in connection with setting meters in iron. It sometimes happens in setting a meter in iron that the inlet and outlet connection will not make up even, consequently there is a tendency to bring a strain on the cones of the meter. By using a device of this nature such a strain is unnecessary.—W. K. Harrington, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 41. *Temporary Gas Supply to be Used When Cutting Mains.*—We have many times found it necessary to maintain some form of gas connection, while a special was inserted in a main or a new or larger pipe substituted, and the scheme shown in the sketch has proven to be very convenient and quickly applied.—A. F. Traver, Supt., Gas Dept., Denver (Col.) Gas & Electric Co.

No. 42. *Soldering Iron.*—The accompanying cut shows a soldering iron, the copper being of the desired size and tapped, the handle being screwed in. This permits of a greater portion of the copper being used before the soldering iron is discarded, and also permits of a greater price being obtained for scrap copper and makes a net reduction in the cost per soldering-iron of 10 cents or more.—W. K. Harrington, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 43. *Meter Carrying Device.*—The accompanying photograph shows a meter carrying device made with a ⅜-inch nipple, 4 inches long, for the handle and a 6-inch wire pipe-hook, bent the proper shape, soldered into the ends of the handle from the eyelet.—A. Hurlburt, McGowan, Small & Morgan Co., Kansas City, Mo.

No. 44. *Meter Bracket.*—The accompanying cut shows a meter bracket so constructed as to readily permit the setting of a meter over a door jamb.—W. K. Harrington, Genl. Supt. Meters, Consolidated Gas Co., New York.

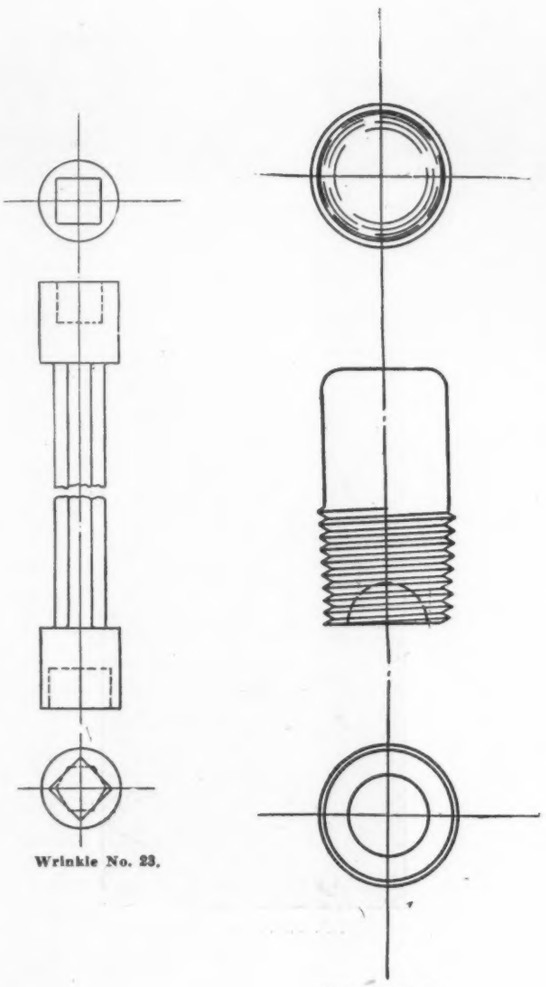
No. 45. *Method of Setting Meters under Houses.*—The sketch shows our method of setting meters under houses. As there are practically no cellars here, and the majority of the meters are set under the house, we adopted the plan of hanging the meters, as per sketch, and find it very satisfactory. Two wire hangers are held loosely by two tin straps each, which are soldered to the bottom of the meters. All iron connections are used on both inlet and outlet of the meter, and wires are attached to the loops of the wire hangers and to nails driven into the joists, at four points, in such position that each set of wires is opposed to the other, forming a very secure support. By this method we overcome all the usual disadvantages of meters set under close places, below floors of houses where bricks and other blocking are so frequently used, which, of course, have a tendency to rust the bottom of the meter. All our prepay meters are set in the house, generally in the kitchen. Our plan is to use a block 1 by 3 by 6, which is toenailed on the edge to the floor directly in the center of the meter from front to back. This permits air circulation and thorough access for cleaning the floor, thereby preventing the rusting of same.—A. F. Kersting, Supt. Mobile (Ala.) Gas Co., Mobile.

No. 46. *Wrench for Removing Cocks from Ranges.*—The accompanying cut shows a special wrench for removing cocks from ranges. In case the ordinary wrench is used, the cocks are frequently damaged.—W. K. Harrington, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 47. *Portable Pipe Vise and Bench.*—The bracket is made of small channel iron, properly braced, which is fastened securely to a pole or tree by a chain which is tightened by simply twisting with a pick handle. This has proven of advantage where we are doing considerable service work, as it can be transported readily from one place to another without the use of a wagon.—A. F. Kersting, Supt., Mobile (Ala.) Gas Co., Mobile.

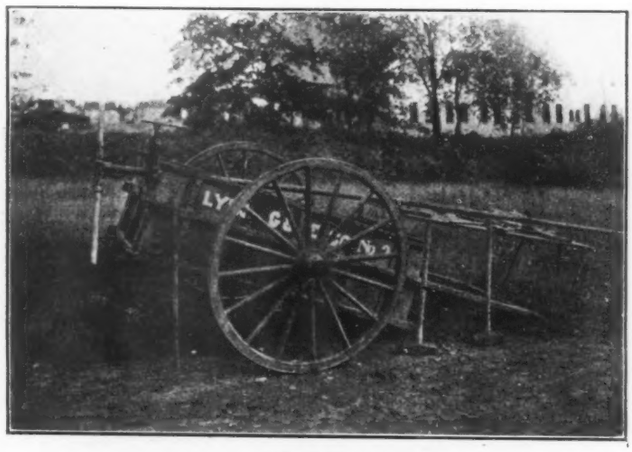
No. 48. *Expansion Plug.*—This expansion plug is to be used in connection with work on live gas. The plug is inserted in the opening and the thumbscrew turned, thereby expanding the rubber and shutting off the flow of gas.—W. K. Harrington, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 49. *Grip for Drawing Sheeting after Filling Ditch.*—As shown by the sketch, it consists of forging in the shape of a "U," the legs being slightly further apart than the thickness of the plank on which it is being used. A chain attached to the hand lever connects with a ring on one side of the grip and forms a very positive hold when strain is applied. This is a vast improvement over the old method of using a chain twisted around each piece of sheeting, for it will be seen that same may be applied to the sheeting from

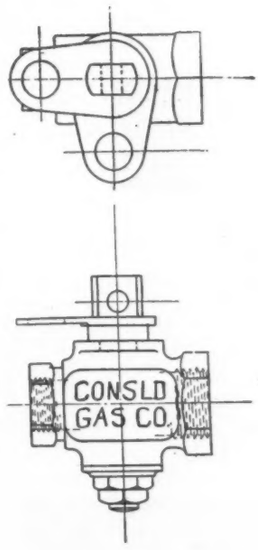


Wrinkle No. 23.

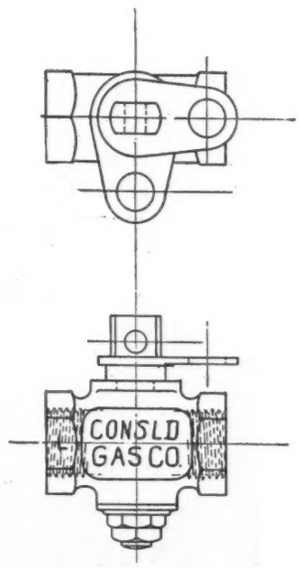
Wrinkle No. 25.



Wrinkle No. 28.

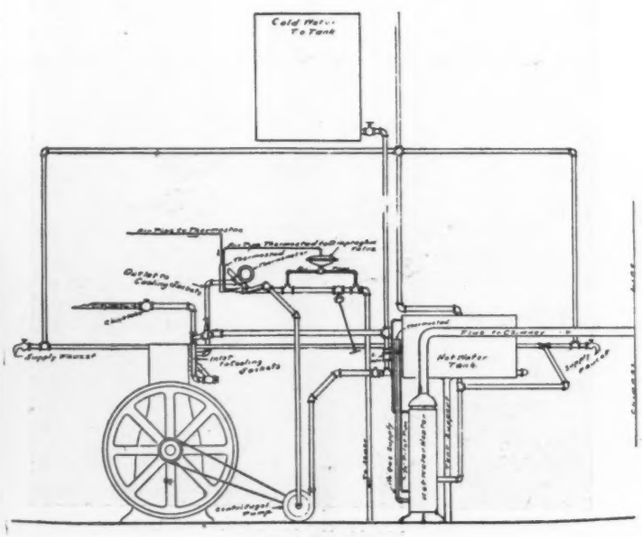


Wrinkle No. 31.

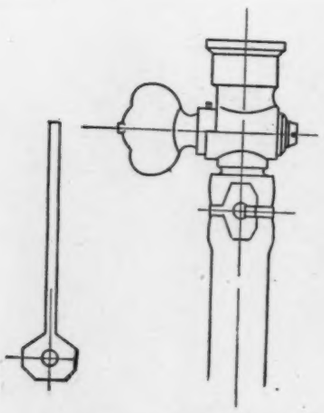


Wrinkle No. 49.

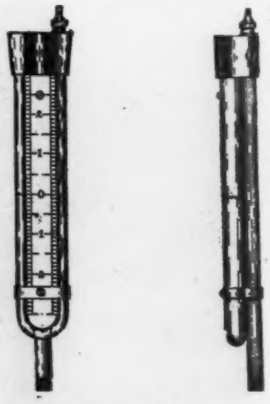
Wrinkle No. 27.



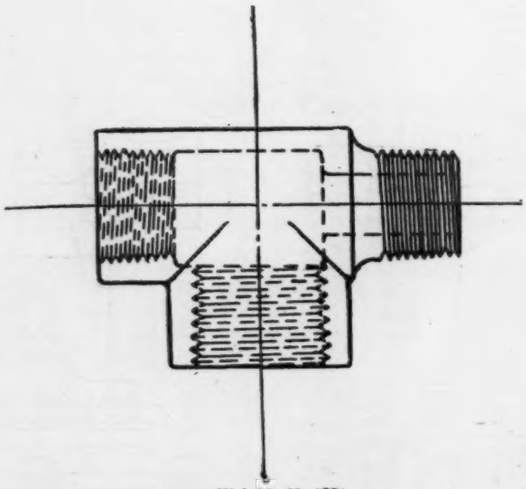
Wrinkle No. 30.



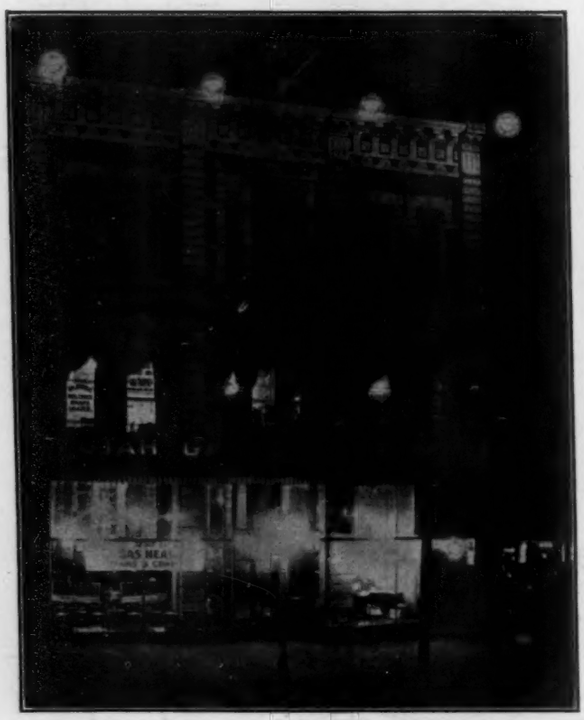
Wrinkle No. 34.



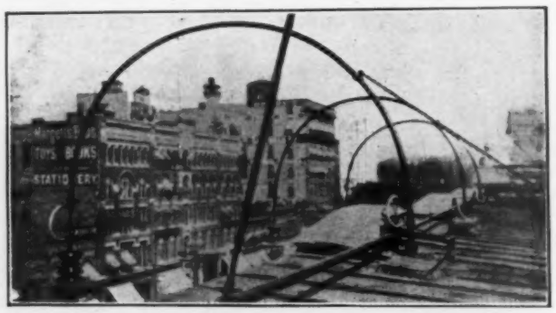
Wrinkle No. 36.



Wrinkle No. 35.



Wrinkle No. 37.—Fig. 1.

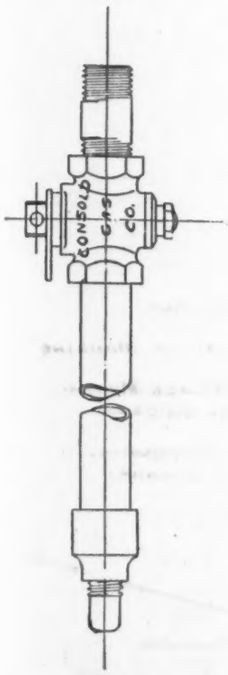


Wrinkle No. 37.—Fig. 2.

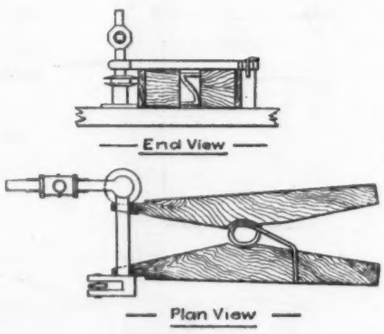
Wrinkle No. 37.—Fig. 3.

Wrinkle No. 37.—Fig. 4.

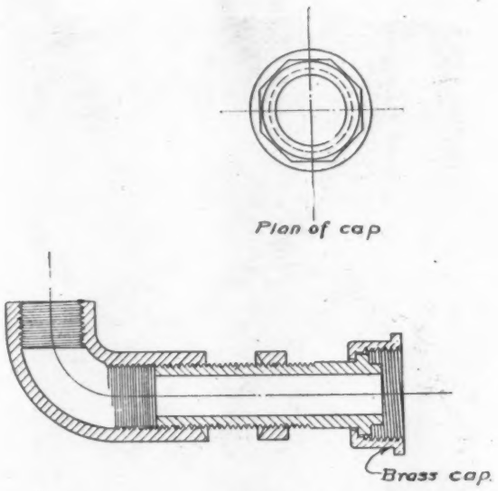
Wrinkle No. 37.—Fig. 5.



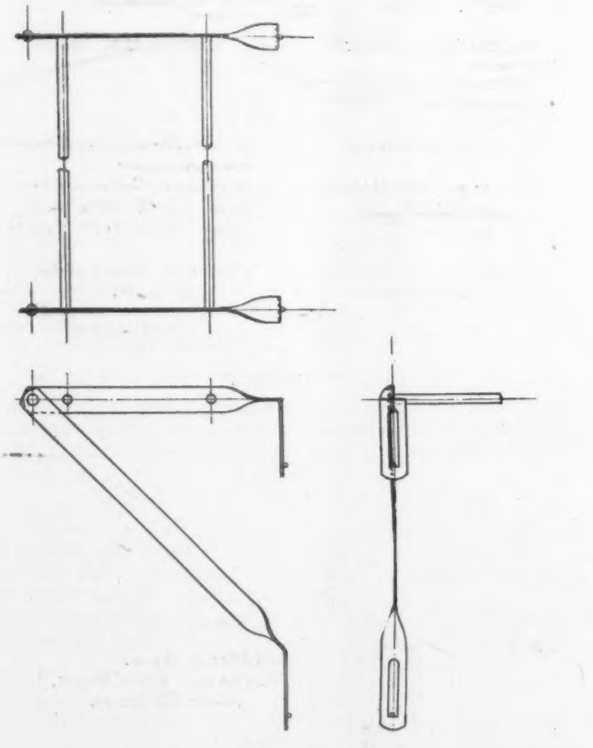
Wrinkle No. 38.



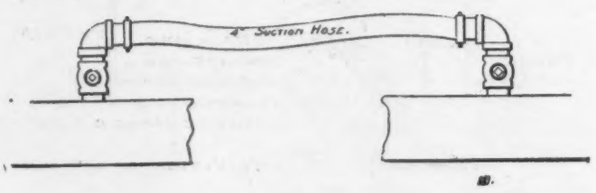
Wrinkle No. 39.



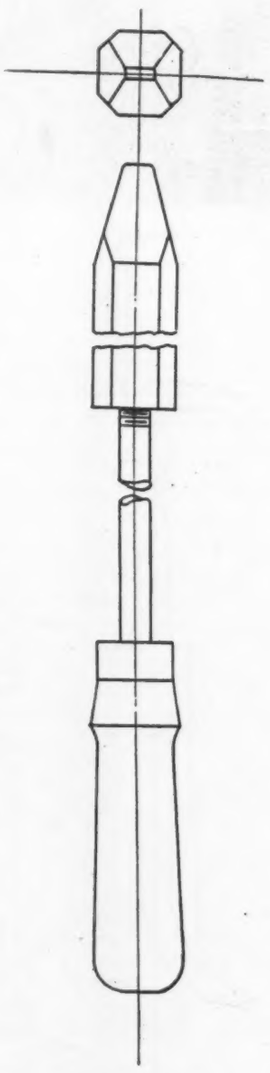
Wrinkle No. 40.



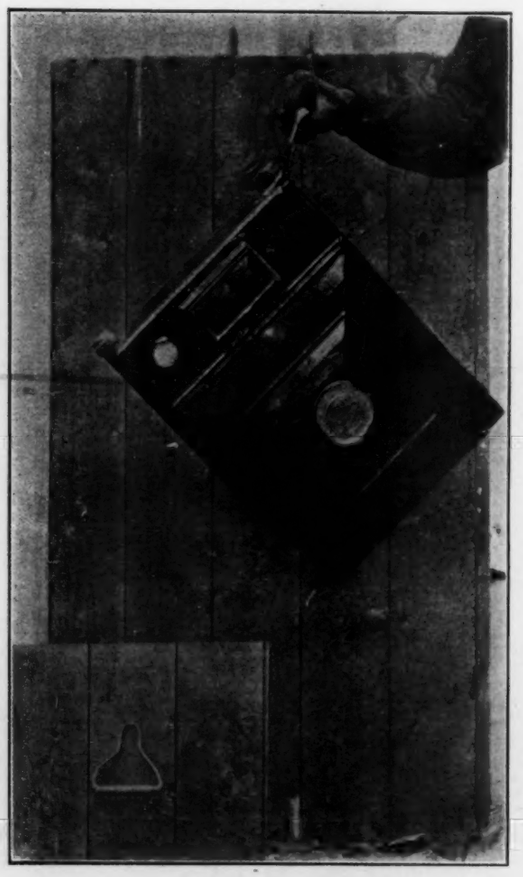
Wrinkle No. 44.



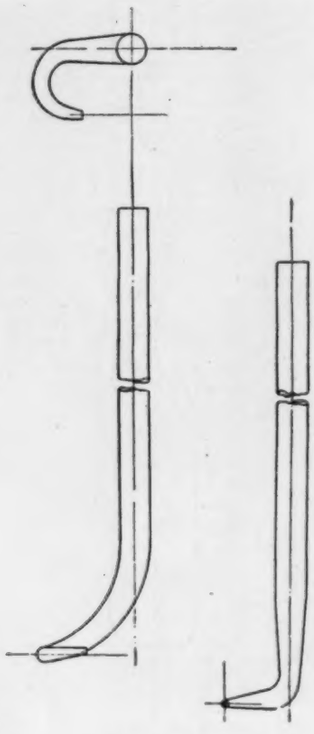
Wrinkle No. 41.



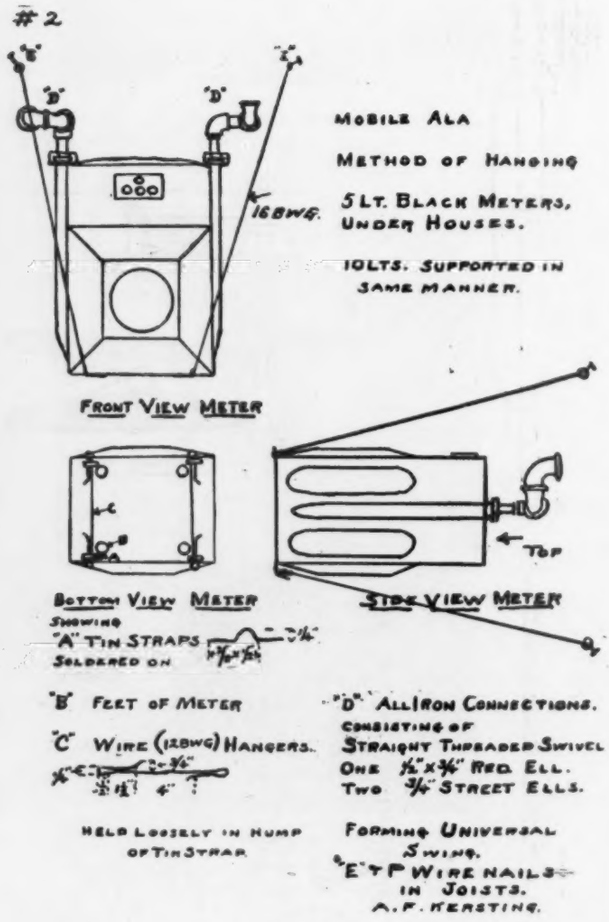
Wrinkle No. 42.



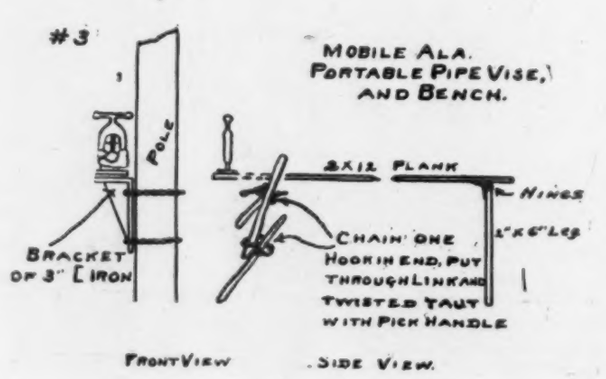
Wrinkle No. 43.



Wrinkle No. 46.



Wrinkle No. 45.



Wrinkle No. 47.

the open edge without any necessity of prying the sheeting apart.—A. F. KERSTING, Supt., Mobile (Ala.) Gas Co., Mobile.

No. 50. *Special Pump.*—An apparatus used in clearing services where the ordinary service pump is not effective. It consists of an ordinary cylindrical tank with an air pump on either side and a small gauge to show the amount of pressure.—W. K. HARRINGTON, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 51. *Portable Instantaneous Leak Detector.*—The accompanying sketch shows a device which will immediately indicate the smallest leak in a closed system to which the apparatus may be attached. A mouthpiece, or pressure tube, "B," is connected through a cock, "F," with both an elastic rubber bag, "A," and with a glass tube, "D," which projects below the water in the air-tight bottle, "C." The joint at "H" is blank, and the tubing connects the system to be tested with the air chamber above the water in bottle, "C." In operation, pressure is applied at "B" with cock "F" open. It immediately equalizes throughout the system. The cock "F" is then closed, and, if there is any leak, the pressure beyond "I" will be reduced and the pressure from the elastic bag will cause bubbles to pass through the water in the jar, "C," at a rate proportional to the size of the leak. This apparatus is very handy in the shop for testing for leaks in fixtures, tanks, etc., while out on a job, it is especially adapted to test house-piping.—DETROIT CITY GAS CO.

No. 52. *Testing Meters for Leaks.*—The attached sketch shows the application of Wrinkle No. 41 to testing meters. The pressure line is connected with the inlet of the meter through a test bottle similar to the one described. The outlet of the meter is connected by flexible tubing and a small nozzle in such a way that the pressure coming through the meter equalizes with the dial chamber above. In operation, if the gas bubbles through the bottle when the outlet cock "A" is shut, it indicates a leak in the stuffing boxes or lower case of the meter. If there is no leak, the cock "A" is opened and the nozzle "B," which is surrounded by a rubber cork, is inserted in a hole punched in the top of the meter. If the jar now indicated a leak, it must be in the dial chamber. The pressure on the test line should be very constant in order to get the best results.—DETROIT CITY GAS CO.

No. 53. *Gauge for Detecting Leaks in Meters.*—The accompanying cut shows a gauge for determining leaks in meters. The height and the smallness of the diameter of the water column are such that a small leak is readily shown. The portion of the back of the glass is covered with sealing wax, so that any variation in the height of the water column is very easily discerned.—W. K. HARRINGTON, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 54. *Card Showing Employees' Record.*—These cards are kept on file and show a complete history of employee from the time of first employment until discharged, or until the employee resigns.—W. K. HARRINGTON, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 55. *Box for Index Glass on Large Meters.*—An index box which permits the renewal of the index glass on large meters on the district, thereby obviating the necessity of bringing in a meter to the shop on account of a broken dial glass. Owing to the locality in which large meters are usually set, the dial glass is more liable to be broken than in the smaller meters.—W. K. HARRINGTON, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 56. *Fitting Chain and Lock.*—In many cases it is necessary to leave fittings for a job some time before the workmen are there to take care of them. The accompanying sketch shows a way of locking them up around some column or fixture. They are as safe with this precaution as though they were in a fitting box.—DETROIT CITY GAS CO.

No. 57. *Gauge for Testing Diaphragms and Channels of Meters.*—The accompanying cut shows a gauge to be used by meter repairers for testing the diaphragms and channels of meters at the bench, and enables the repairer to discover many leaks at the bench which would ordinarily be overlooked until discovered by the gassers. The use of this gauge obviates the necessity of sending the meters back to the repairer to be again opened and repaired on account of leaks.—W. K. HARRINGTON, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 58. *The Use of Smoked Glasses for Adjusting Inverted Lights.*—The maintenance men in Detroit carry smoked glasses for use in making careful adjustment of reflex and other inverted burners. In this way they are enabled to examine the light very closely, without injury to the eye.—DETROIT CITY GAS CO.

No. 59. *Baffle-plate for Gas Flue.*—A special form of flue tee to be used in setting gas ranges. The arrangement is such that no explosion will occur due to backdraft. In case there is such a downward or backdraft, the current of air will strike the deflector and pass out at the bottom of the tee.—W. K. HARRINGTON, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 60. *Method of Repairing Broken Fixtures.*—Having experienced more or less trouble from broken arms on fixtures, caused by the use of portable gas tubing, we devised a scheme of our own to overcome same. We took the header out of a 4-light fixture, drilled a ⅛-inch hole in the bottom, put in a short nipple, on the end of which we attached a portable lamp cock, which came just below the brass casing, making a tip or point at the bottom of the fixture, doing away with the possibility of breaking the arms by the weight of the gas tubing.—NEW LONDON (CONN.) GAS & ELECTRIC CO.

No. 61. *Meter Gearing.*—A gearing between the index shaft and the crank shaft of the meter whereby the lost motion between these two parts is materially reduced. The lost motion between these parts is frequently the source of great annoyance in the proving and testing of the meter.—W. K. HARRINGTON, Genl. Supt. Meters, Consolidated Gas Co., New York.

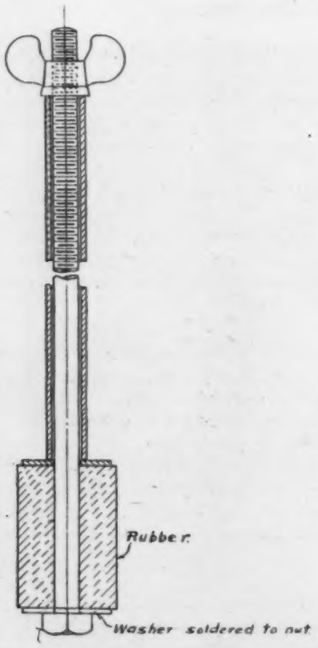
No. 62. *Adjustable Index.*—An index so arranged that the hands may be readily set back to zero without operating the whole of the mechanism. This is done by inserting a key, which throws out a part of the gearing, thereby permitting the main dial wheels to be readily set back to zero. The wheels cannot be moved until the key has been inserted and turned; neither can the index box be put on until the key has been removed. The removing of the key brings that part of the mechanism which has been thrown out of gearing into place.—W. K. HARRINGTON, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 63. *Meter Inspection Form.*—The accompanying cut shows the form used by a special inspector who visits all new sets within a few days after they are made. The cut of the meter on the back enables him to illustrate graphically the location of any trouble.—DETROIT CITY GAS COMPANY.

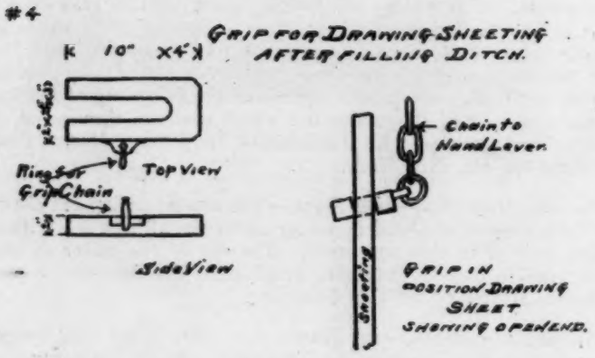
No. 64. *Key Badge.*—All district men carry a key ring badge, a copy of which is shown in the illustration. Since this badge has been in operation the number of keys lost has been noticeably reduced.—W. K. HARRINGTON, Genl. Supt. Meters, Consolidated Gas Co., New York.

No. 65. *Automatic Oiling Device for Dipping Meters.*—The accompanying sketch shows an accurate, rapid, and cleanly way of measuring out a predetermined quantity of oil and injecting it into the diaphragm chambers of meters. The oil tank "A" is connected at the bottom to a 3-way cock "B," and at the top to an air pressure line, although it may be only vented to the atmosphere. The air pressure line "C" is also connected, by means of small brass tubing, to the measuring chamber "D." The bottom of the measuring chamber is connected with the 3-way cock "B." From the lower opening of the cock is suspended a short piece of flexible tubing with a nozzle inserted in the end capable of being inserted into a small hole punched through the side of the meter. A detail of the measuring chamber is shown at the right. The distance the small brass tube projects into the cylinder determines the amount of oil that the apparatus will deliver. In operation when the cock is thrown one way, the chamber fills with oil up to the bottom of the brass tube, and when the cock is reversed the oil is forced rapidly into the meter by the air pressure from above. As many measuring chambers can be installed on one oil tank as desired. The error due to the variation of the height of oil in the small brass tube will be less than 1 per cent. in most cases.—DETROIT CITY GAS COMPANY.

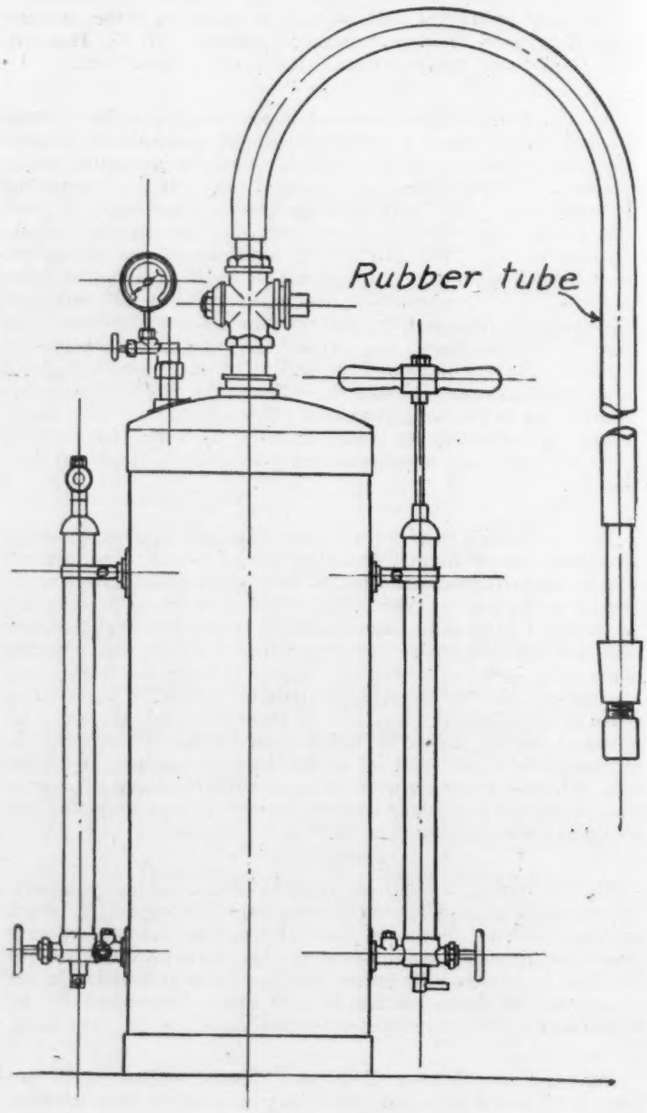
No. 66. *Folding Wind Shield for Arc Lights.*—The accompanying sketch shows a folding wind shield for use in taking care of



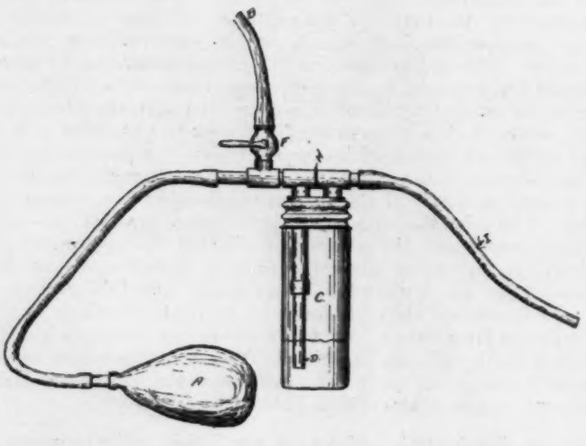
Wrinkle No. 48.



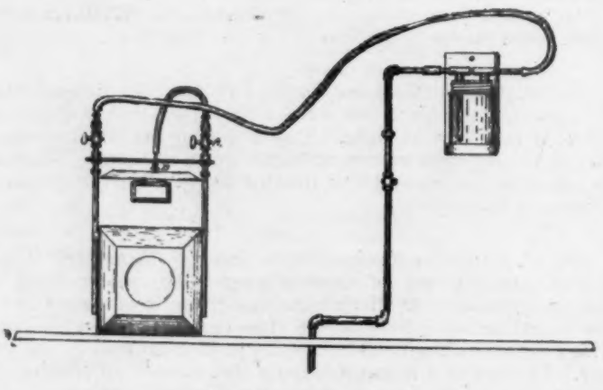
Wrinkle No. 49.



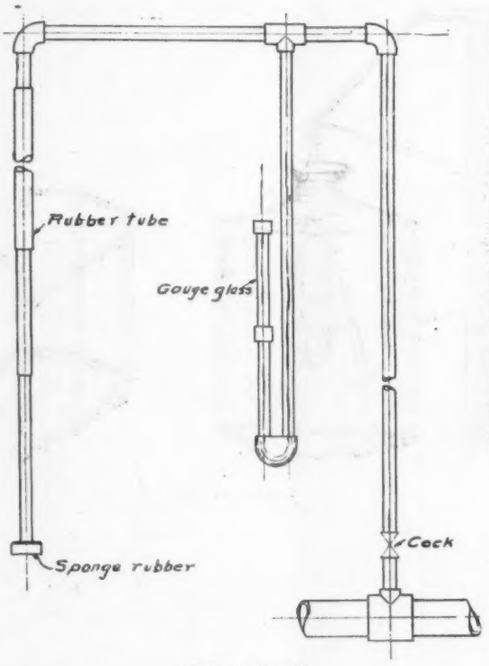
Wrinkle. No. 50.



Wrinkle No. 51.



Wrinkle No. 52.



Wrinkle No. 53.

Name ... No.

Address ... Co. ... Ave. ... No. ... Borough / City

Age ... Married / Single ... Date of employ ... Rating at time employed ... Qualified for

Rated now ... Mutual Aid Yes / No ... Friendly Aid Yes / No ... Steady Lot Yes / No ... References Ye / No

Pay last increased ... From ... To ... Employed by other Co. Yes / No ... Name of other Co. ... Cause for leavin

Rating in other Co. / Br. ... Employed by other Br. Yes / No ... Name of other Br ... Cause for leaving

Disch. from other Co. / Br. Yes / No ... Cause for discharge ... Discharged by

General Characteristics: Neat / Sloucby; Quick / Slow; Ambitious / Indifferent; Strong / Delicate; Accurate / Careless; Sober / Drinks; Industrious / Lazy; Quiet / Agressive; Tall / Short; Dark / Light; Stout / Thin

General Capacity: Superintendent; Asst. Supt.; Foreman; Asst. Foreman; Pay Roll / Meter / Stove / Shipping Ticket / Store Room Clerk; Inspector; Fitter; Stenographer; Helper; Set Meters Large / Small; Connect Ranges; Connect W. B.; Burners; High Bill; P. P. Complaints; Hrs. P. P. Keys; Jobbers; Exchange Meters; Exchange Stoves; Setter; Test Meters; Test Stoves Leaves; Rep. Stoves Shop / Dist.; Con. Complaint; Meter Operator; Repairer; Pitcher O. T. / C. T.; Cutter O. T. / C. T.; Washer; Painter; P. P. Apprentice; Stove Cleaner; Sheet Iron Worker; Duct Sewer / Tier; Watchman; Janitor; Messenger; Helper Shop / Dist.; Carpenter; Pipe Mach. Man.

Wrinkle No. 54.—Fig. 1.

TIME LOST

Including Dates	Reason	Paid for	Full or Half Time	Amount Paid

DISCHARGED

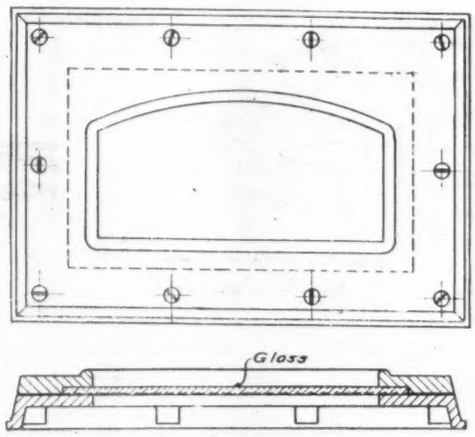
Date	Reason	Company	By whom

INCREASE OF WAGES

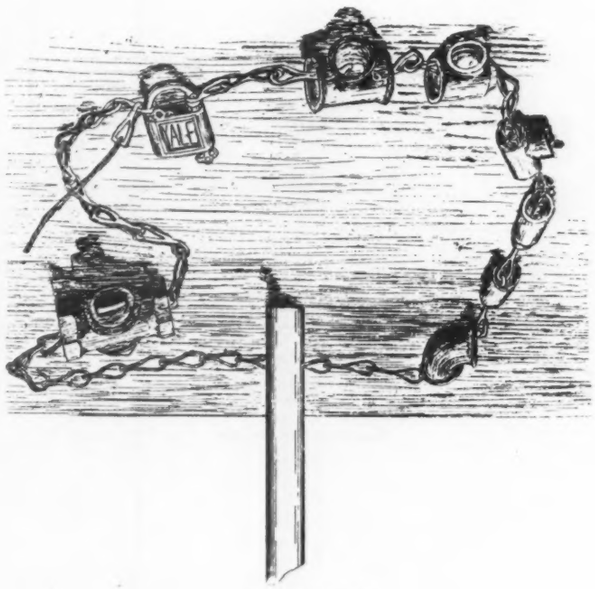
Date	From	To	Reason

Reported by	Date of Report	Reported for

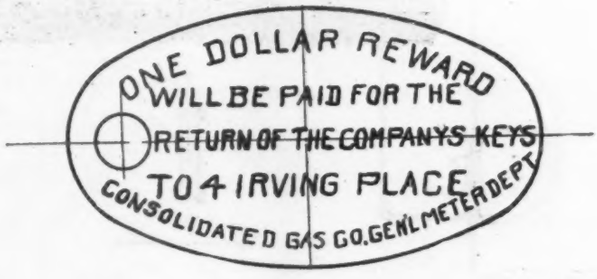
Wrinkle No. 54.—Fig. 2.



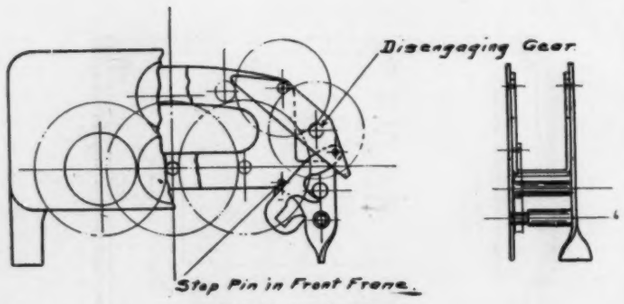
Wrinkle No. 55.



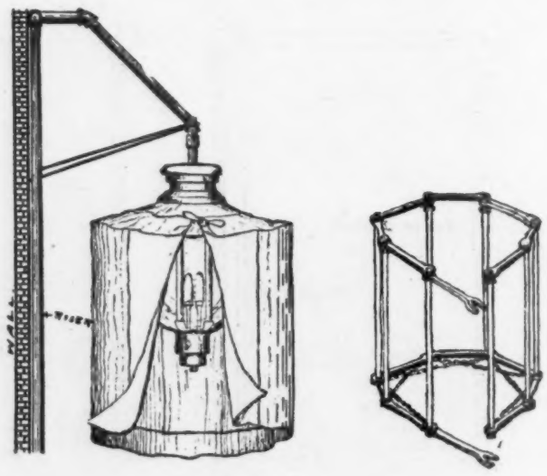
Wrinkle No. 56.



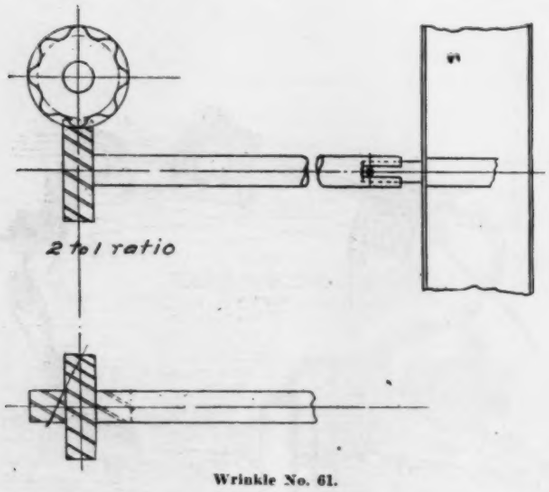
Wrinkle No. 64.



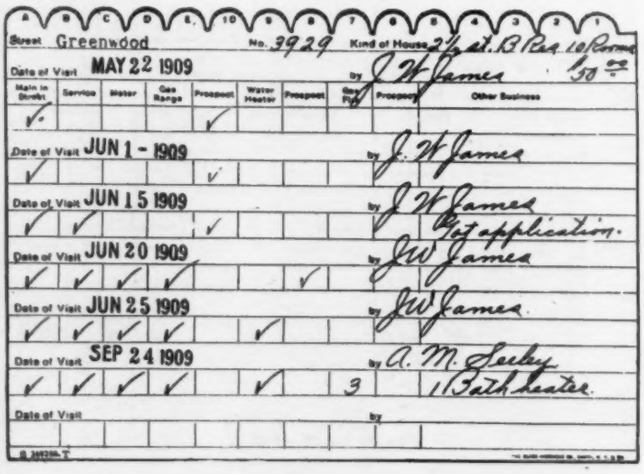
Wrinkle No. 62.—Fig. 2.



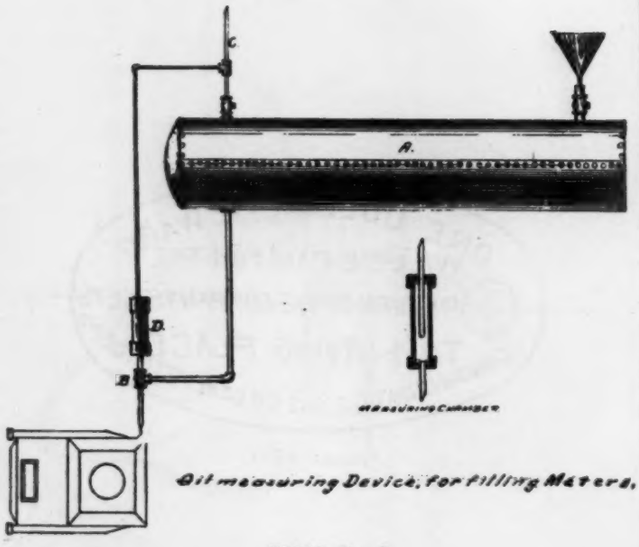
Wrinkle No. 66.



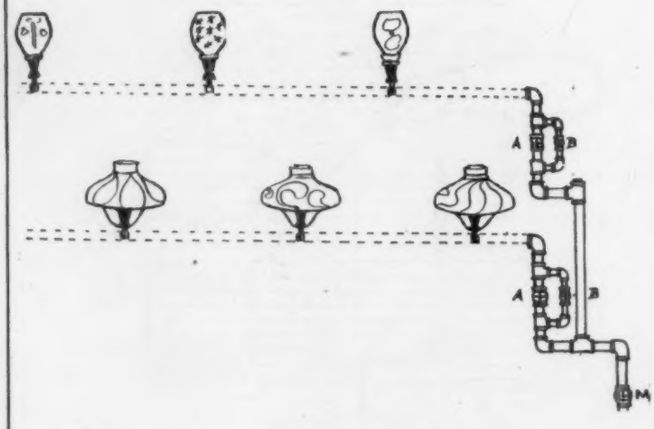
Wrinkle No. 61.


Street Greenwood No. 3929 Kind of House 2½ st. B Res. 10 Rooms
Date of Visit MAY 22 1909 by J. W. James 50 cts
Main in Street | Service | Meter | Gas Range | Prospect | Water Heater | Prospect | Gas Fire | Prospect | Other Business
Date of Visit JUN 1 - 1909 by J. W. James
Date of Visit JUN 15 1909 by J. W. James Got application.
Date of Visit JUN 20 1909 by J. W. James
Date of Visit JUN 25 1909 by J. W. James
Date of Visit SEP 24 1909 by A. M. Seeley 3 1 Bath Heater
Date of Visit by

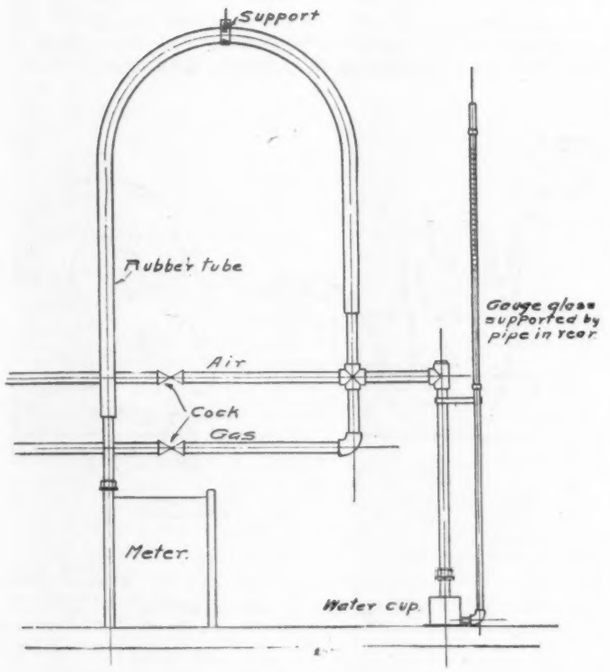
Wrinkle No. 67.



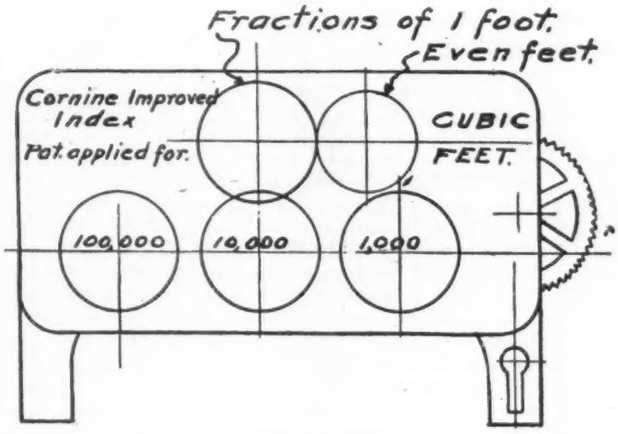
Wrinkle No. 65.



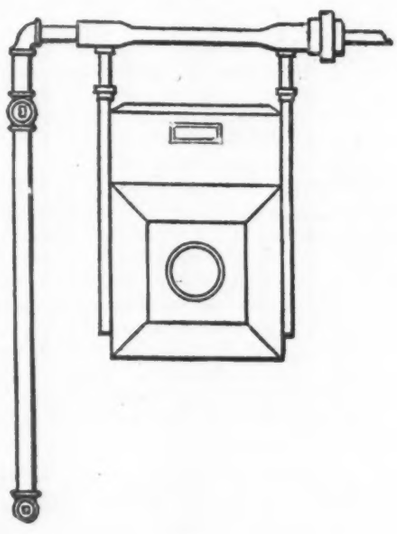
Wrinkle No. 68.

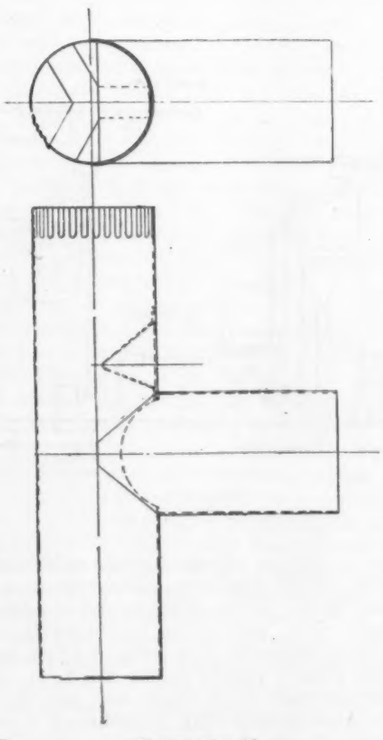


Wrinkle No. 57.



Wrinkle No. 62.—Fig. 1.





Wrinkle No. 59.

METER SET INSPECTION.

Address .....

Name .....

Any leak about meter? .....

(Indicate on back the location)

Is meter properly set? .....

Is location of meter good? .....

Remarks .....

.....

..... Lt. ..... Index ..... OO .....

Executed ....." ..... 190..... Time .....M.

Employee .....

Wrinkle No. 63.

outside arc lights. The shield consists of a jointed, steel-wire frame covered with cloth. At the lower end of the frame each panel is tied with chains across to the second panel from it in rotation. These flexible cross ties will allow the shield to fold inward into a flat bundle, but will hold it rigidly in an octagonal shape when opened up. The cloth cover extends 6 inches above the frame, and a heavy cord ran through the hem is used in hanging the shield onto the arc as shown in the sketch.—DETROIT CITY GAS COMPANY.

No. 67. *Card for New Business Department.*—The accompanying cut shows a form of card which we use in seeking new business for keeping up with the condition of service in each house. On the back of the second card is a key to the meaning of tabs on the first card. You will observe that the tabs at one end, A, B, C, D, E, represent the character of the house, expressed in the number of dollars per month for which it will probably rent. The house I am sending rents for $50 per month, so tabs A, B and C would be cut off, and D left on. At the beginning there is a main in the street and no service. Tab No. 1 is cut off. After the second or third visit we get in a service and a meter; Tabs No. 2 and No. 3 are cut off. On the fourth and fifth visits a gas range is sold and a water heater installed. Tabs 4 and 5 are cut off, and so on until the house has every character of service which we are prepared to furnish, and the 8 tabs on the right-hand side are cut off. These cards are placed in drawers arranged by streets and numbers. If it is desired to send out canvassers to push water heaters, the eye can see at a glance every house which has a main and a service and no water heater. That is, tab No. 5 would still be on the card. By looking at the other end of the card it can be determined whether or not the house is of such a character that the occupants can probably afford a water heater.

You will see that with this system, worked out and kept up-to-date, every scrap of information which is brought into the office by the canvassers is preserved in shape to be used by any future canvassers, and by glancing over the cards representing any street the exact condition of that street as a place in which to seek new business is at once apparent.—DONALD MCDONALD, Pres. Kentucky Heating Co., Louisville.

No. 68. *Gas "Footlight" System Installed in Sidewall of Salesroom for Showing Lamps and Glassware.*—All piping is concealed, only the brackets, lamps and wheels of the valves showing. The valve in the main line M is used to turn the system off each night. The valves, A A, are so adjusted that, with one short turn to the left, all the gas will be shut off except enough passing through the by-pass valves B B to keep a fair-sized pilot light going in each lamp. A turn to the right with the valves A A will instantly light up the whole line of glassware. We use on each line of piping 24 lamps, which give us a fine assortment of lamps and glassware to show with no more than a turn of a valve.—GRAND RAPIDS (MICH.) GAS LIGHT CO.

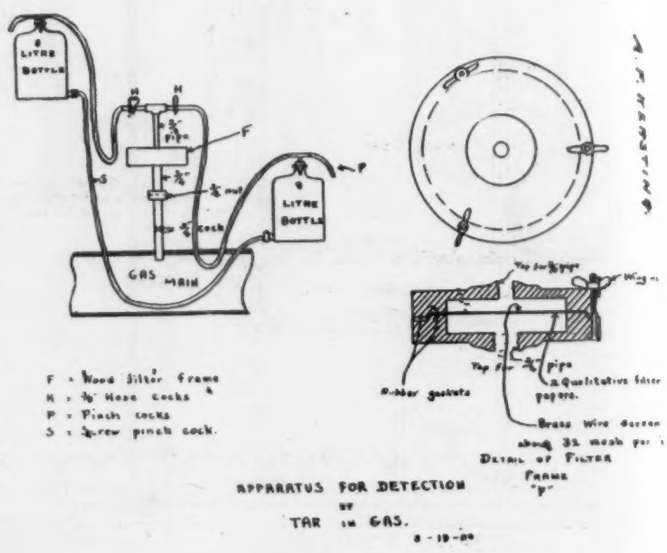
No. 69. *Use of Gas for Heating Asphaltum Tanks.*—We have recently made installation of gas burners, under a tank to be used for heating asphaltum, in which steel pipe is dipped. This tank is 35 feet long, 3 feet deep, and 3 feet wide, the pit being concave in shape. The installation consists of seven special burners, which have a capacity of 1,400 feet per hour. These burners are used in full capacity for from 3 to 4 hours, to bring the asphaltum to a boiling point, and then the consumption is cut down to about 800 feet. This displaces the use of wood as a means of heating, and we not only make a saving over other fuels, but also a saving on the cost of labor and lessen the danger of fire. When using wood, the work required the services of 2 men, one man to fire and the other to watch the tank; with the present arrangement, one man supplies all the necessary labor, consequently making a saving of one man's time.—G. S. PEARSON, Denver (Colo.) Gas & Electric Co.

The Grand Rapids (Mich.) Gas Light Company places a sticker, printed as follows:

> "You will notice that the period covered by the meter readings from which this bill is made, is for more than the regular 30-day month."

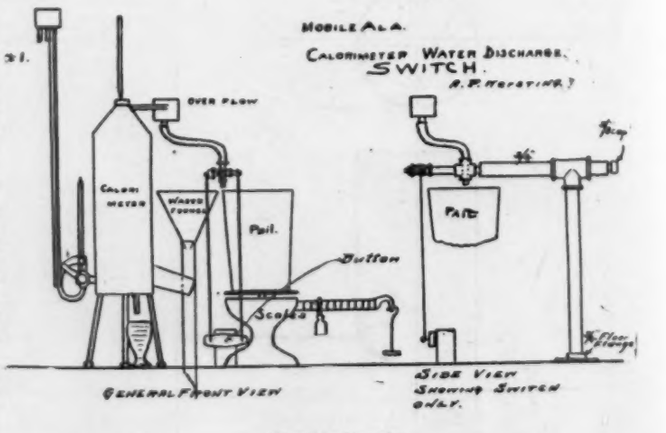
to every gas bill that is for more than a month's consumption; and it keeps down the complaints from consumers who would without it not notice the fact that the larger bill is due to irregular times of taking statements.

No. 70. *Method of Determining Tar in Gas.*—The accompanying sketch is of a device for determining the relative quantities of tar which are carried by gas. The sketch shows clearly the apparatus and method, the gas being drawn from the gas main, through filter papers, into bottles which furnish means of measuring the quantity of gas passed through the filter papers. A meter may, of course, be substituted for the bottles. Comparative tests on equal quantities of gas will show clearly the relative quantities or tarry matter carried.—W. S. BLAUVELT, Supt., Coke Oven Dept., Solvay Process Co., Detroit, Mich.


LITRE BOTTLE
GAS MAIN
F = Wood filter frame
H = ¾" Hose cocks
P = Pinch cocks
S = Screw pinch cock.
Rubber gaskets
Brass wire screen
DETAIL OF FILTER FRAME "F"
APPARATUS FOR DETECTION OF TAR IN GAS.

Wrinkle No. 70.

No. 71. *Method of Operating Junkers Calorimeter.*—The accompanying sketch illustrates a device for the instantaneous switching of the discharge water from Junkers calorimeter, and, as per sketch, is arranged so that the rubber tubing from the overflow passes through a ¾-inch cross, which is made into a ¾-inch pipe, in turn being supported inside of a ¾-inch pipe; two cords are attached to the plug screwed into a second ¾-inch cross and the opposite ends to a wooden button fastened to the table. The operator is able to pay minute attention to the meter dial and secures a positive switch of the discharge, without waste, exactly at any desired reading of the meter. Our burner is adjusted to about 7 feet per hour. Five readings of the water thermometers are taken during the consumption of 2/10ths of a foot, the water being adjusted to run about 7 pounds during this time. Two complete determinations are made on a single test, and the difference in water used is never greater than 2/100ths of a pound.—A. K. KERSTING, Supt., Mobile (Ala.) Gas Co.



Wrinkle No. 71.

(Continued from page 725.)

[Communicated.]

Method for Keeping Accounts of Small Gas Concerns.

[By Mr. F. Lincoln Hutchins.]

Labor Account.

In order to have any proper accounting of labor it is necessary to have job slips and to have them correctly symbolized. This can be accomplished by providing pads of slips, say 3 by 5 inches, in following form:

Name employee ....No.....
Date..... .....
Job.....Symbol
.....
.....
Time Time Used
finished.....begun..... time.....
Rate..... Amount $.....
Remarks.....
.....
O.K.'d by.....

These slips to be the basis of pay of employee. The symbol may be written in by employee when competent to apportion same, or by some other authority. Having received the slips, they are to be computed and the amount entered on classification sheets carrying at their tops the various accounts and their symbols arranged in order as headings for the columns. The slips can be accumulated during the pay period, or entered upon a payroll sheet by days. In any event, the total of the payroll to be paid must agree with the aggregate total of the classification sheet, thus proving both accounts and assuring the proper charging of all items into this part of the expense account. As the amount to pay received by the employees must be same as that charged into the account, any omission to make proper charge will be sharply brought to attention by complaint of employee of shortage in pay.

This completes the accounting of all charges against the plant. Turning, now, to the revenue side, it is seen that that here also it is necessary to have an individual unit record properly symbolized for the guidance of the one who is to keep the accounts.

The Revenue Account.

The first requisite is a unit record of charges, which can be best had by use of loose leaves upon which each individual customer can be shown. The meter record should show: Name and location of customer; location of the meter; size, number, and any other desired data concerning the meter or the customer; date of reading; number of feet; consumption; making double columns of 12 lines each affords room for 24 readings. That used by the Consolidated Gas Company, of Boston, Mass., is both practical and convenient. These slips should also carry the district number where the service is divisible into such, should be arranged in order of the meter or customer location and placed in a loose leaf binder, but only as many as the reader can cover in a day, which allows of taking the slips out in the morning and returning them completed at night, with the exception of the skips, which can be returned to the reader for immediate attention the next day. The slips should be read at regular intervals, either on the same day each month, or better at 30-day intervals.

Slips should also be made for all other than meter customers, upon which the monthly charges can be entered. The same slip form may be used for occasional or exceptional service. These slips should be symbolized, according to the schedule, by some competent person so that entering them can be done by one who has no expert knowledge of the service covered by same. When these slips are returned, with the readings and charges shown, they are to be entered upon the revenue register; when entered they are to be indorsed with the folio and line number upon which they are entered. The bills for service are then to be made. These should be made in duplicate, by the carbon process, and carry the revenue register folio and line number for identification. The original can then be delivered to the customer and the duplicate filed by its number when paid; the duplicate can be so stamped and be entered upon the receipts register.

Making the revenue register from the charge slips and then making the bills from the same charge slips with a totalling of both results assure the proper making of charges and the entering into account of every item without mistake. Of course, any discrepancy in the totals would require a check to locate the differences, but having the carbon bills in order as shown by the register makes this a rapid and sure process.

The Revenue Register.

This should be a sheet of the same size as that of the purchase register and carry the following heads:

1. Names of customers and meter numbers, arranged in order of reading.
2. Posting reference.
3. Line number.
4. Debit to customer.
5. Credit to municipal service.
6. Credit to commercial service.
7. Credit to railroad service.
8. Credit to other electrical concerns.
9. Credit to other miscellaneous service.
10. Credit to any of the ledger accounts.

Under items 5, 6 and 9, the heading is divided to show: Cubic feet consumed; class; amount.

Under items 7 and 8, divided to show kw. hours and amount.

Under items 9 and 10, to show class and amount, a posting check to follow each column of amounts. By using short sheets for successive months, the original writing of names and meter numbers would serve until the number of changes required a rewriting. In most cases once a year would be all sufficient.

In addition to the revenue register is a classification sheet carrying the names and symbol of the accounts across the top. At convenient seasons the items upon the revenue register are to be transferred to this classification sheet, and, having the municipal, commercial and other grand divisions placed together upon the classification sheet, the totals of those columns must be the same as the total of the column upon the register, thus proving the work. Another safeguard is that in drawing off all the items in the municipal column must have the symbol "M.," and coming across any other shows at once that there has been an error in entering into the wrong column, and it can be corrected before the figures are totalled. By continually carrying forward totals, the aggregation for each class can be had at any time. This will facilitate the making of reports, statements or other requirements when demanded.

Closely connected with the revenue register is the "Receipts Register," which sheet should have columns as follows:

Date.	Amount credited to customer.
Name of payer.	Debit to discount and allowances.
Posting reference.	Debit to cash.

Using the same size sheet as for the revenue register permits of three repetitions of these headings and prolongs the time during which each folio can be used. When payments are made for any charges shown upon the revenue register they are to be entered here with the folio and line of the revenue register in the posting column. The device of duplicate bill makes this easy and sure. Then, by checking with the revenue register and entering thereon the folio and line of the receipts register, makes unnecessary any consumer ledger account, although such can be kept if it be thought worth the while. The total shown upon the receipts register should be made up into a separate bank deposit to facilitate checking of that account. When entering payments the total amount of the bill charged upon the revenue register should appear in the credit to customer. The discounts and allowances under that heading and the cash under that head.

When a party makes part payment it may be handled in either of two ways:

First.—Hold money and memorandum of payment entirely aside from the accounts until the payment is completed; or

Second.—Enter upon receipts register the cash received and the allowance made, then make up a new bill for the balance and enter this bill upon the journal as a suspense account, entering in the posting column reference to both the journal and the revenue register. When the balance is paid, the posting reference will be made upon the journal, as that will be found the only entry of that balance, which fact will be shown by reference to the revenue register.

The amount of customers accounts outstanding at any time will be shown by the difference between the credit and debit accounts upon the general balance register to be described later. This total is checked by the items that remain unchecked upon the revenue register and with the checks and balances, which make errors almost impossible, no surer balance of account can be had.

Cash Register.

The large majority of cash transactions being carried upon the receipt and bank registers, the entries upon the cash register will be few and mainly confined to petty cash transactions. Its columns

will be as follows: A large center column for items; credit items upon the right for cash, ledger, expense, customers, merchandise and jobbing, creditors, income. Debit items upon the left with same headings.

To provide for those entries which are not applicable to the foregoing described sheets, such as transfers from one account to another, accrual and depreciation accounts, there is a "Journal Register," which has columns as follows: A wide center column to contain a description of the item; columns on either side showing heads for: Ledger accounts, creditor accounts, customer accounts, income accounts, expense accounts, merchandise and jobbing accounts.

Each of these to be subdivided by spaces for: Class number, amount of money, posting check. The right side of the register to be marked "Debits," the left side, "Credits."

Aside from the regular operations of the current accounts, certain accruals of charges must be made monthly. To provide for these a competent party should draw up a memorandum for the benefit of the person keeping the accounts. This memorandum can be after the following form:

Interest.—Charge monthly on account of the funded debt $\frac{1}{12}$ of the total funded debt interest during the current year, making entries as follows: Right hand ledger column page 316; left hand income account, symbol Ii.

When payment is made, debit ledger column page 316 and credit cash, and the balance in this ledger account will show the interest accumulated that is unpaid. It is simply a matter to divide this amount between that which is matured and due and that which is unmatured and not due. Other interest accounts should receive a like treatment, including discount on bank loans in interest accrued.

Taxes.—A close estimate of the amount of taxes that will be applicable to the current year should be made and the bookkeeper told to charge $\frac{1}{12}$ of this at the end of each month. Any discrepancy between the estimate and the actual tax may be adjusted during the last 3 months of the year by increasing or decreasing the monthly charge. The entries would be: Credit accrued taxes under ledger page 310; debt income tax account, "It." When the tax bill comes to hand, credit liabilities and debit taxes accrued. When payment is made, credit cash and debit liabilities. The difference between the two sides of the tax accrued account will then represent either the unpaid taxes of the current year or a prepayment of tax reaching over into a future period.

Insurance.—At the close of each month charge $\frac{1}{12}$ of the premium which covers the year of the account, and the journal entry will be: Item column; insurance; expense column upon left side against symbol A1, amount. Ledger or capital column, against page 304, amount. [The ledger pages under this number may be lettered a, b, c, etc., and each suspense account separately kept, as for instance this insurance account.]

When check is drawn to pay premiums, the bank register will show in ledger column against symbol 304 the amount of check. The difference between applied and paid for insurance will show the prepayment of same without other computation.

Depreciation.—At close of each month enter on journal the depreciation as required by the accounting order as follows:

Item column: Depreciation.
Left hand expense column (symbol 51) amount.
Right hand ledger column (page 334) amount.

When parts of the plant are retired from service, the entries in the journal will be:

Item column, description of the part retired; left side ledger column (page 292), amount scrap value; left side ledger column (page 334), balance of original cost of part; right hand ledger column, total amount of original cost of part set against the page number on which the particular part is charged to plant.

Material and Supplies and Merchandise and Jobbing.—These two accounts are distinct and separate, the first being an asset ledger account, the second a current revenue account. When materials and supplies are taken in, which are not to be immediately applied to some definite expense account, the charge is to be made to the material and supplies account by entering charge in ledger column page 292 upon the purchase register. As this supply is drawn upon for use in the plant through requisition, the ledger account is credited and the particular expense account, or in some cases the construction account, is debited, the entries being made upon the journal showing items and symbols. When supplies are drawn for sale or to go into the jobbing account then the charge is to that account.

In both of the above cases the charge and credit must be at the rate at which that particular supply stands in the materials and supplies account, but it is permissible to add the transportation costs to the invoice price.

The proper accounting for credits to materials and supplies due to drawing from same can be accomplished in no better way than by allowing no material to be taken except upon a requisition slip showing to what account it is to be charged. When it is necessary to take a larger amount than is likely to be used the requisition should accompany the returned material and a credit made upon same, when, of course, the credit and charge would be made upon the net amount. When supplies are sold at a profit they must first be transferred from the material and supplies account at cost price through journal entry; that is, crediting ledger column, page 292, on right of sheet, and carrying same amount to merchandise and jobbing column on left hand side. The cash or invoice price will, of course, appear as a credit to merchandise and jobbing, and the difference will show the profit to this account. In order to tie the whole system into one connected whole and to assure the continuous balancing of all accounts there is the

BALANCE REGISTER.

Into this is closed all of the other registers, and as each of those is self-balancing, the result, when brought together, must balance if the work is correctly done, and it will not balance as long as there is any error in entries to the different sides of these accounts.

This register has columns as follows:

Ledger accounts	Debit and credit.
Cash accounts	" "
Customer	" "
Productive expense	" "
Transmission and storage expense	" "
Utilization and commercial expense	" "
General expense	" "
Creditor accounts	" "
Income accounts	" "
Merchandise and jobbing	" "

Having all the totals for each of these accounts brought together from all of the registers accumulates all of the debits and all of the credits, the balance between the two exhibits showing the true condition of the concern. In fact, it is a perpetual trial balance from which the standing can be obtained at any time.

The closing of the books is effected at any time by closing the revenue and expense accounts into the profit and loss account by entering the totals of all the non-ledger accounts into the ledger columns upon the journal. For instance, say the total productive expense is $10,000, the entries upon the journal will be:

Dr.		Cr.
	Productive expense	10,000
10,000	Ledger, page 344	
12,000	Revenue accounts	
	Ledger, page 344	12,000

and then a statement of the assets and liabilities with the surplus account gives the balance sheet. The difference between the liabilities account, called here the creditor account, shows the amount outstanding liability in this account, and this can be checked by the unposted items in the purchase register. The difference between the customers' accounts shows the accounts receivable in this account, which can be checked by the unposted items upon the revenue register.

In opening the accounts the totals of the opening entries upon the registers are carried to the head of this balance register, and the total of the debit items equalling the total of the credit items the sheet is in balance, and as no entry can be made in the current accounts without its opposite the accounts must remain in balance at all times. The posting to this register may be made daily, weekly or monthly, according to the volume of business; but it is well not to accumulate more than 30 entries in any account without carrying all totals to the balance register, for the reason that any errors are more easily located. No expert knowledge is needed in changing from any method already in use, nor in closing accounts at any time, if the following instructions are observed:

When possible, the change from old to new accounting method should be as of December 31st, when the balances are drawn for the closing of the books for the year. If the old system was kept in single entry proceed in the following manner to transfer the accounts:

Go through the old accounts and balance them by writing the word "balance" upon the lesser side of the account, placing in the money column the necessary amount to make both debit and credit

columns equal, then carry this amount down to the opposite side of the account below the balancing rule.

Draw off, upon the journal register, the names of all customers who owe the concern, placing the names and ledger pages in the center column, showing the amount due in the column headed "Customers" upon the debit side of the sheet.

Draw off the names of all creditors to whom the concern owes a balance, upon the journal register, in the same manner, only showing the amounts in the columns headed "Creditors" upon the credit side of the sheet. Draw off upon the journal register all accounts that have been carried in the ledger, which are shown under the title "Indicant accounts" in the Uniform System of Accounts; placing the amounts under the heading Ledger Accounts, being careful to place all credit balances upon the credit side and all debit balances upon the debit side of the sheet.

If the capital, or Indicant Accounts, have not been kept upon the old accounting method it will be necessary to set them up. To do this a careful inventory should be made of the physical property, divided to the accounts shown in the "Uniform System of Accounts." When this is made, the several divisions should be entered by title upon this journal register. The various amounts being entered in the column headed Ledger Accounts, all assets being placed upon the debit side. A like treatment should be made of other assets than the physical property if there be such. The debt and stock accounts should be similarly treated and the amounts entered under ledger accounts upon the credit side of this journal register. If in the old accounts there are expense or revenue accounts, their balances should be also carried to the journal against the title "Surplus" or "Deficit Account." Should there be prepayment accounts, they should also be carried to the journal as a part of the asset accounts.

All the columns of the journal register should be added after all of the entries have been made. The difference between the total debits and the total credits will now be added to the item "Surplus or Deficit Account," on the lesser side of the sheet in the column headed ledger accounts. If the accounts have been kept under the double entry system, it is, of course, only necessary to close the books and carry to profit and loss account all expense and revenue items, then transfer the other balances to the journal register in the same manner as detailed above for balances. Having made all of the opening entries and assured the agreement of the aggregate credits with the aggregate debits the new account can be commenced.

THE LEDGER.

From the fact that there will be comparatively few entries to make in the ledger under this system, it can be a small affair, say 5 by 8 inches. It should be of the loose leaf variety in order that only those accounts that affect the concern may be set up and yet allow of any additions when same come to be necessary.

A Comparative Investigation of Oiling Methods, Oils and Diaphragms for Meters.

[A paper by Messrs. R. B. ACKER and C. C. HOTCHKISS, Chicago, Prepared for the Sixth Annual Meeting, Illinois Gas Association.]

The question of "oiling" meters has attracted the attention of gas men, generally, since the admirable paper of Mr. J. M. Rusby ("Proceedings," Am. Gas Inst. 1906, p. 354), of the U. G. I. Company, Philadelphia, read before the American Gas Institute in 1906. It is from him that we first hear of the "dipping" meter, and the use of neutral mineral oil as a remedy for diaphragm "bleaching." The study of the problem has since been taken up by other gas men, ("Proceedings," Am. Gas Inst., 1907, pp. 909-918; 1908, p. 97), and much has been contributed to our knowledge of dipping meters. The latest development in meter oiling is the so-called "Autoiler," a self-oiling meter brought forth by Mr. Thomas D. Miller, of New Orleans. ("Proceedings," Am. Gas Inst., 1909, p. 571.) For the benefit of those who are not familiar with diaphragm troubles, and the processes leading to bleaching of same, it might be well to recapitulate briefly.

It is generally believed that the bleaching of meter diaphragms is caused by temperature changes in buildings in which meters are set. If the temperature of the building is below that of the incoming gas, condensation of the gas-oil vapors on the diaphragm ensues; the diaphragm oils being highly soluble in this condensate are dissolved out. The process continuing, the diaphragm oil is much diluted and gradually drips out to bottom of meter, the final result being a leather free from diaphragm oil, but soaked in a highly volatile condensate. So great is the affinity of gas oil vapor for diaphragm oil that it may be absorbed by the diaphragm oil, even when the temperature of the meter is slightly above the temperature of the incoming gas.

It is obvious that the rising of the temperature of the meter, containing this diaphragm wet with condensate, above the temperature of the incoming gas, will result in the condensate being again taken up by the gas, leaving the leather dry and bleached. A condition, in which the diaphragms were alternately wet with condensate and dry by evaporation of same, would account for variations in registration. It has been our object to study the problem of meter oiling on our own account and obtain comparative data of the different oiling devices and different oils, which would enable us to decide on their respective merits. Toward this object meters were subjected to alternate conditions of cold and heat which, as previously described, cause bleaching of diaphragm leathers. Seeking, in other words, to place meters under artificial conditions easily controlled, which would imitate in a pronounced degree conditions met in actual service. A water tight tank was constructed of galvanized iron, provided with running cold and hot water connections, and drain by means of which the temperature of the meters could be regulated by immersion in cold or hot bath. Into this tank 12 meters, provided with glass fronts for easy study of the leathers, were placed with proper gas connections. Four of these meters were of the regular oiled diaphragm type, four of the "dipping" type and four of the self-oiling type. In each group of four, one meter was oiled with neatsfoot oil, one with diaphragm mixture (equal parts sperm, rapeseed and neatsfoot oils), one with No. 4 neutral mineral oil, and one with cod liver oil. Cod liver oil was tried because of its extensive use by tanners in oiling leather, its low congealing point and good penetration. These meters were all of 5-light capacity—in good working order. All oils were applied at 120° F., and after being worked and kneaded the leathers were allowed to drip 24 hours before being placed in meters. Twelve ounces of oil, at room temperature of about 70° F., was placed in each side of dipping meter by means of holes punched in side of case. Holes were then plugged by soldering in rivets.

Twenty ounces of oil, at room temperature, was placed in the gallery of each self-oiling meter. These meters were furnished by Maryland Meter Company, and were of the type described by Mr. Miller, of New Orleans. They are of the regular 5 light type, the dial mechanism incased and with wicks inclosed in tubes extending through the bottom of the gallery. The frayed ends of these wicks are in contact with the top of the diaphragm leathers and the oil is fed by capillarity and gravity from the gallery of the meter. (See Fig. 1.) All meters stood on proving room floor for 24 hours before

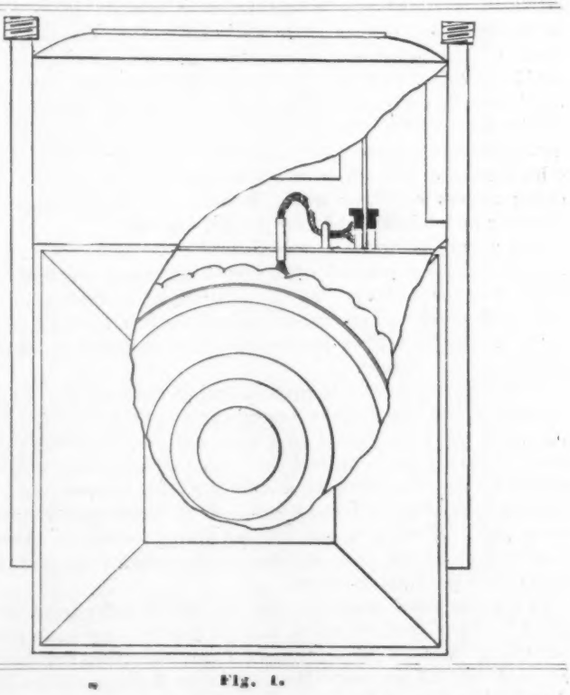


Fig. 1.

initial proof was taken. Each meter was connected with a cluster of five lava tip burners adjusted to burn at rate of 30 cubic feet per hour.

Beginning with a cold bath, the meters were subjected to alternate cold and hot baths, each of one week's duration. At each change from cold to hot, and vice versa, the leathers were examined, the meters gassed for leaks, and the proof, check and open, carefully taken. Not much could be learned from individual weekly examinations. It was only by tabulation of results and comparison of averages that conclusions could be drawn. This test was continued for a period of 63 actual running days. At the end of this time the meters were allowed to run at room temperatures for four weeks, being examined and proved each week. The meters were then stripped and the leathers examined. After stripping and the primary examination the meters were stacked on the shop floor, a second examination being made on the third day and a final inspection on the eighth day after stripping.

It is rather hard to compare leathers as to degree of oil contained except in a general way. Table I. gives the comparative condition of

TABLE I.—*Showing Final Condition of Leathers.*

	Kind of Oil.	1st Day.	2nd Day.	3rd Day.
REGULAR.	Neatsfoot.	Moist with oil of little body.	One leather a little dry and stiff.	Fair.
	Diaphragm Mixture.	Moist with oil of little body.	Well moistened with oil of little body.	Fair.
	Mineral #4.	Moist with oil of little body.	Well moistened with oil of little body.	Fair.
	Cod Liver.	Fairly moist.	Somewhat dry.	Somewhat dry.
DIPPING	Neatsfoot.	Well oiled.	Well oiled.	Well oiled.
	Diaphragm Mixture.	Well oiled.	Well oiled.	Well oiled.
	Mineral #4.	Well oiled.	Well oiled.	Well oiled.
	Cod Liver.	Well oiled.	Well oiled.	Well oiled.
SELF OILING	Neatsfoot.	Rather well oiled.	Rather well oiled.	Rather well oiled.
	Diaphragm Mixture.	Rather well oiled.	Rather well oiled.	Rather well oiled.
	Mineral #4.	Fair.	Fair.	Fair.
	Cod Liver.	Fair.	Fair.	Fair.

the diaphragm leathers in these meters. In the final examination on the eighth day there could be no doubt of the well-oiled condition of the dipping meters. All these diaphragms, regardless of oil used, were in best condition possible. Of the self oiling meters, those oiled with neatsfoot and diaphragm mixture were not as well oiled as the dipping meters, yet they were in very good condition. In Table I. these have been designated as rather well oiled. The remaining two of the self-oiling meters, those oiled with No. 4 mineral and cod liver oil, could be called only in fair condition, containing oil, but with a tendency toward dryness. In Table I. these are listed in fair condition. Of the meters with the regular type of oiled diaphragms none could be called well oiled. The three meters oiled with neatsfoot, diaphragm mixture and mineral oil were in fair condition, the one oiled with cod liver oil somewhat dry. It is evident that if the alternate changes of temperature had been continued further the regular oiled type of diaphragm would have been first to bleach. The self-oiling meters would, no doubt, be next in turn, the dipping meters showing no tendency whatever toward dryness.

One way of comparing proof data of these meters was to take the averages of all check and open proofs made and see how these differed from the initial proofs. Comparison of individual meters does not yield much of importance beyond the fact that, all things considered, mineral oil has the better of the argument as an emollient or softener for leather.

On comparing meters in groups, taking the averages of all figures for each group, we find the average proof of the dipping meters differs from the initial proof by 1.9 per cent. on the check and 1.6 per cent. on open pipe. Contrast this with the self-oiling meter, which differs 4.2 per cent. on check and 3.6 per cent. on open proof, and the regular type which differs 4.6 per cent. on check and 2 per cent. on open pipe. In other words, the self-oiling meters, on the average, have proven 2.3 per cent. and the regular type 2.7 per cent. faster on check than the dipping meters.

In the last proof made the dipping meters differ from the initial proof by 2 per cent. on check and 1.7 per cent. on open pipe. The self-oiling types 3.9 per cent. and 3.7 per cent. The regular type 4.7 per cent. and 1.5 per cent. Here again the dipping meters differ less than half as much from original proof than the self-oiling and regular types.

The maximum variation on the check proof in dipping meters was

TABLE II.

	OIL	NO.	FIRST PROOF Check	FIRST PROOF Open	AVERAGE PROOF Check	AVERAGE PROOF Open	Difference From First Proof Check	Difference From First Proof Open	Diff Btwn Check & Open Proofs Avg. Proofs	LAST PROOF Check	LAST PROOF Open	Difference From First Proof Check	Difference From First Proof Open
REGULAR	Neatsfoot	1	101.0	101.0	96.8	99.5	4.2	1.5	2.7	95.5	99.5	5.5	1.5
	Dia. Mix.	2	101.0	101.0	95.0	98.3	6.0	2.7	3.3	95.0	102	6.0	1.0
	Mineral #4	3	100.0	100.0	96.2	98.2	3.8	1.8	2.8	96.0	98.5	4.0	1.5
	Cod Liver	4	100.0	100.0	96.6	97.9	4.4	2.1	1.3	96.5	98.	3.5	2.0
	Averages		100.7	100.5	96.1	98.5	4.6	2.0	2.3	95.7	99.5	4.7	1.5
DIPPING	Neatsfoot	1	100.0	99.5	97.4	99.2	2.6	.3	1.8	98.	99.	2.0	.5
	Dia. Mix.	2	99.5	100.5	97.2	95.8	2.3	4.7	1.4	98.	96.	1.5	4.5
	Mineral #4	3	100.5	100.0	98.1	99.2	2.4	.8	1.1	98.	98.5	2.5	1.5
	Cod Liver	4	100.0	99.5	99.0	98.7	.5	.8	.3	98.	99.	2.0	.5
	Averages		100.0	99.8	97.9	98.2	1.9	1.6	1.1	98.	98.1	2.0	1.7
SELF OILING	Neatsfoot	1	101.5	100.5	97.0	97.0	4.5	3.5	0.0	98.	97.5	3.5	3.0
	Dia. Mix.	2	100.0	99.5	95.8	95.8	4.2	3.7	0.0	98.	95.5	4.0	4.0
	Mineral #4	3	101.0	100.5	97.6	98.9	3.4	1.6	1.3	98.	98.5	3.0	2.0
	Cod Liver	4	100.0	100.0	95.2	94.5	4.8	5.5	.7	95.	94.	5.0	6.0
	Averages		100.6	100.1	96.4	96.5	4.2	3.6	.8	96.7	96.4	3.9	3.7

TABLE III.—*Maximum Variation.*

	Oil	No.	Check	Diff.	Days	Open	Diff.	Days
REGULAR	Neatsfoot	1	95.0	6.0	8	97.5	3.5	8
	Dia. Mixture	2	94.0	7.0	43	95.5	5.5	43
	Mineral #4	3	94.5	5.5	48	97.0	3.0	18
	Cod Liver	4	94.0	7.0	48	95.0	5.0	48
Averages			94.4	6.4	36.7	96.2	4.2	39.2
DIPPING	Neatsfoot	1	96.5	3.5	43	98.5	1.0	18
	Dia. Mixture	2	95.5	4.0	53	94.0	6.5	53
	Mineral #4	3	97.0	3.5	48	98.0	2.0	48
	Cod Liver	4	97.0	3.0	53	98.0	1.5	53
Averages			96.5	3.5	49.2	97.1	2.7	43
SELF OILING	Neatsfoot	1	96.0	5.5	53	96.	4.5	58
	Dia. Mixture	2	93.0	7.0	8	94.	5.5	8
	Mineral #4	3	97.0	4.0	38	98.	2.5	8
	Cod Liver	4	93.0	7.0	48	93.	7.0	48
Averages			94.7	5.9	36.7	95.2	4.9	30.5

3.5 per cent. faster than initial proof and was reached in 49 days. The greatest variation on open proof in dipping meters was 2.7 per cent. fast reached in 43 days. In the self-oiling meters the maximum variation was 5.9 per cent. fast in check and 4.9 per cent. fast on open proof, reached in 36 and 30 days, respectively. The regular diaphragm type showed a maximum variation of 6.4 per cent. fast in check and 4.2 per cent. fast on open pipe, in 36 and 29 days.

The dipping meters have a maximum variation from the initial proof, about half that of the other types, which variation has required a third longer time. In other words, the falling off of the dipping meter from the initial proof, while being very small, was also very gradual, covering considerable time. The other types, while showing twice as much variation as the dipping meter, have fallen off more abruptly. Our compilation of proofs does not show the self-oiling meter to hold up any better than the old oiled diaphragm type.

As a supplementary test 300 meters, all oiled with No. 4 mineral oil, were put in service, 100 of which were dipping meters, 100 self-oiling and 100 the oiled diaphragm type. A large number of these meters have been removed to date and inspected. These meters were brought into the shop, stripped, their diaphragms examined, and then allowed to stand on shop floor for several days when they were again inspected. By this method, those meters in which the diaphragm oils had been replaced by condensate would show bleached leather by evaporation of condensate.

In the final inspection 39.4 per cent. of the dipping meters were in an A, or well oiled condition, 39.4 per cent. in a B, or fairly oiled

condition, 21.2 per cent. in a C, or bleached condition. Of the self-oilers, 33.3 per cent. were in an A condition, 41.7 per cent. in a B condition and 25 per cent. in a C condition. The old type showed 10.5 per cent. in A condition, 42.2 per cent. in B condition and 47.3 per cent. in C condition. Of the three types the dipping meters have highest percentage of well oiled and lowest percentage of bleached leathers. The fact is established that it is possible for a dipping meter to become bleached, for when the diaphragms are saturated in condensate but little oil can be taken up by capillarity. The fact remains, however, that after bleaching the dipping meter can recoil itself very readily.

From our experience the self-oiling meter bleaches more readily than the dipping meter, and when bleached does not oil itself as readily or rapidly. We have also noted that the self-oiling meters have a tendency to bleach first at top where the leather comes in contact with wick feeding the oil.

In connection with the preceding experiments we made a series of tests to determine the comparative capillarity of diaphragm leathers under different conditions with the various oils above mentioned. To determine this, strips of leather ½ inch wide and approximately 2 feet long were placed in neatsfoot oil, diaphragm mixture No. 4 mineral oil and cod liver oil. In each oil were placed strips of new, unoiled leather, bleached leather removed from a meter after 10 years' service, and new leather soaked in condensate from which the excess had been allowed to evaporate. The rise of the oil was measured from time to time and recorded in inches. The results are shown in Table IV.

TABLE IV.—*Showing Capillary Rise in Inches of Different Diaphragm Oils in Various Samples of Leather.*

OIL	SP.G.	KIND OF SAMPLE	Duration in hours					
			24 hrs	68 hrs.	144 hrs.	216 hrs.	384 hrs.	696 hr
Neatsfoot	.9156	New Leather	5-3/8	7-1/2	9-3/4	10-3/4	13-1/4	15-1/2
		Bleached Leather	6-	8-	10-1/4	11-3/4	13-1/2	15-
		New Leather + Condensate	5-3/8	7-3/4	10-1/8	11-5/8	14-	15-3/4
Diaphragm Mixture	.8919	New Leather	7-3/8	10-1/4	13-1/4	14-5/8	17-1/4	20-
		Bleached Leather	6-1/2	9-5/8	12-7/8	14-3/4	17-3/4	21-1/2
		New Leather + Condensate	6-1/8	8-3/4	11-3/4	13-3/4	16-1/8	19-1/2
#4 Mineral	.8621	New Leather	6-	9-1/8	12-1/2	14-	17-1/8	20-3/4
		Bleached Leather	6-1/4	9-3/4	13-1/2	15-5/8	19-5/8	24-1/4
		New Leather + Condensate	6-	9-1/8	12-5/8	14-3/4	18-3/8	20-1/2
Cod Liver	.9257	New Leather	6-1/2	9-1/4	11-	11-1/4	11-3/4	11-3/4
		Bleached Leather	7-	9-1/2	10-5/8	10-3/4	10-3/4	10-3/4
		New Leather + Condensate	6-1/8	8-	9-	9-1/4	9-1/2	9-1/2

The congealing points of the various oils are as follows:

Neatsfoot ..... 28–32° F. No. 4 mineral.....28–30° F.
Dia. mixture..... 26–30° F. Cod liver.....14–16° F.

It is seen that all the oils rise equally well up to 144 hours, but following this the No. 4 mineral oil and the diaphragm mixture have the advantage, while at the end of 696 hours (29 days) the No. 4 neutral mineral oil had reached the top of the various leathers. The cod liver oil maintained the maximum previously reached at the end of 216 hours, while the neatsfoot oil was still rising slowly. The use of the latter oils, or in fact, of any animal or vegetable oil, in a meter is not recommended because they are subject to decomposition resulting in free fatty acids with deleterious effects. It would seem that the bleaching of the leather causes oil to rise faster than in case of new leathers, while new leather soaked in condensate, the excess being allowed to evaporate, does not materially affect the rise of the diaphragm oil. The weight of different oils taken up by diaphragms and the effect on this absorption due to the leathers first being soaked in condensate are shown in Table V.

It is seen that while new leather, soaked in condensate from which the excess had not been allowed to evaporate, takes up more drip than does bleached leather soaked in condensate, from which likewise the excess had not been allowed to evaporate. The new leather absorbs somewhat less diaphragm oil, ranging from 2 to 7 per cent., than the bleached leather. So, from a study of the capillarity and the amount of oil absorbed, it will be seen that new leathers soaked in drip oil, from which the excess has not been allowed to evaporate,

TABLE V.—*Showing Comparative Weight of Oil Absorbed, in Ounces, per Ounce of Leather.*

Diaphragm Oil	Kind of Sample.	Weight of drip oil per ounce leather.	Weight of Dia. Oil per ounce leather.	Total oil.
Neatsfoot.	New Leather	---	1.51	1.51
	Bleached Leather	---	1.18	1.18
	New Leather in drip	.96	.45	1.41
	Bleached leather in drip.	.62	.46	1.08
Diaphragm Mixture.	New Leather	---	1.44	1.44
	Bleached Leather.	---	1.21	1.21
	New Leather in drip	.92	.32	1.24
	Bleached Leather in drip	.82	.34	1.16
#4 Mineral	New Leather	---	1.37	1.37
	Bleached Leather	---	1.28	1.28
	New Leather in drip	.98	.34	1.32
	Bleached Leather in drip.	.73	.38	1.11
Cod Liver	New Leather	---	1.46	1.46
	Bleached Leather.	---	1.28	1.28
	New Leather in drip	.91	.33	1.24
	Bleached Leather in drip.	.71	.40	1.11

will not re-oil themselves as well as new leathers soaked in drip oil, from which the excess had been allowed to evaporate. Thus it might be observed that a diaphragm from which the diaphragm oil has been practically dissolved out and replaced by drip oil would not tend to re-oil itself readily until the excess of drip oil had evaporated. It is true, however, that the presence of drip oil in a meter diaphragm generally keeps the latter in a pliable condition.

The amount of mineral oil absorbed by the bleached leather is within 6.6 per cent. of that taken up by the new leather, 15.9 per cent. less of the diaphragm mixture is taken up by the bleached than the new leather, while 12.3 per cent. and 21.8 per cent. less are taken up by the bleached leather with cod liver and neatsfoot oils, respectively.

From the point of view of both capillarity and amount of oil absorbed by the bleached leather, it may be concluded that bleached diaphragms (drip oil not being present in such quantities as to render the diaphragms pliable) will not fail to oil themselves satisfactorily when proper means of oiling are provided. Our best results were obtained by using the dipping method of oiling with No. 4 neutral mineral oil, and from the data obtained shows that we can satisfactorily oil diaphragms up to at least a 150-light size.

Tests were also made of the tensile strength of diaphragm leathers under different conditions. The test samples of leather were cut so that an amount equivalent to 1 inch wide and 2 inches long was subjected to test between specially constructed jaws of a Riehli testing machine. The test sample is shown in Fig. 2.

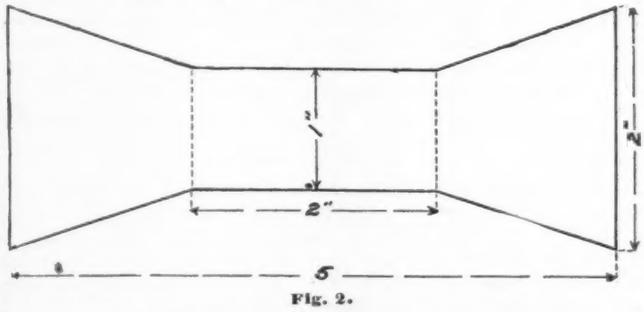


Fig. 2.

The results are given in Table VI., which gives the averages obtained on a number of samples.

It will be noted that unoiled bleached leather, after 10 years' service, compares favorably in point of strength with new leathers variously treated. So the use of old, bleached diaphragms provided, of course, they are not in too poor a condition, might be continued in dipping meters where by capillary action they could re-oil themselves and probably would not have to be renewed for considerable time. We might add that, while leathers removed from meters after

10 years' service have been found to be in fair condition after unfavorable oiling, that it would seem likely that new leathers which could be kept continually oiled in a dipping meter ought to last indefinitely.

TABLE VI.

Kind of Leather.	Final Breaking Point in Pounds.
New leather, unoiled	35.1
Bleached leather, 10 years old, unoiled	40.3
New leather, seasoned with No. 4 neutral mineral oil	44.3
New leather soaked in neatsfoot oil	36.6
" " " diaphragm mixture	46.8
" " " No. 4 neutral mineral oil	37.5
" " " cod liver oil	33.6

A Few "Do's" and "Dont's" for Small Coal Gas Works.

[Prepared by MR. H. L. RICE, Aurora, Ills., for the Sixth Annual Meeting, Illinois Gas Association.]

This paper is, with the approval of your Committee, wholly elementary. I confine it to coal gas practice, as the small Illinois plants make principally coal gas, and my excuse for it is, not that I feel any especial qualification as critic or adviser, but that, from some experience respecting the operation of small works, I can, perhaps, and wholly from personal observation, bring out a few points that may here and there be of value. I address principally the managers of our small gas companies, those hard working, conscientious men who must cover daily every detail of their business, from works to finance, and be themselves its entire brain and sinew. In this best of all training schools in our business any helpful suggestion is, to my certain knowledge, always welcome and I ask pardon only for a perhaps unnecessary didacticism, adopted, however, solely for the sake of brevity.

Benches.—In refilling benches don't hastily take stock plans or the lowest bid. Study your arch and ask each contractor for the best design he can make for your exact dimensions. Don't favor firms that will not submit drawings for your arch. Ascertain if you can cut down or lower your foundation. One nearby works lowered 12 inches at a cost of $75, and by this, together with careful study of design, gained 10 per cent. efficiency. Throw out narrow ash pans; 22-inch is narrow enough for a half-depth six. Don't be afraid to throw out any inefficient ironwork. In old-style circular arches use 16 by 26 top retorts to gain the necessary space. Insist on retorts of right length for your arch, avoiding excessive backing and space right, slotting bolt holes in bridge pipe flanges if necessary to adjust standpipes. Don't vary size or length of charges on all your retorts to accommodate demand, thus injuring all the retorts, making naphthaline, and demoralizing your workmen. Run as many benches as your minimum sendout will allow, full and steady at maximum efficiency all the time, and take up variations in output with a pick-up bench, for which select the bench nearest the end of its useful life.

Hydraulic Main.—Tap a test hole in every standpipe and test the entire row of pipes when the exhauster is running steady. Adjust hydraulic main and dippipes until you finally get every standpipe running on the same back pressure. Check this frequently. To obtain this most important condition, first correct level of main as far as possible, and then any differences that may still exist by the use of sleeves or more permanently by trimming the dippipes. Keep dippipes free from carbon accumulations. Don't tolerate the old-style tar-and-liquor off take. A steady seal is too important. Separate off-takes are easy to install on any main and will quickly repay their comparatively small cost. Don't leave pipes open on benches not in use. This is an invitation which the exhauster seldom refuses, if given time enough. Test the hydraulic and take-off main up to the exhauster occasionally for leaks by backing up pressure, and keep tight. A small leak will cut off many heat units.

Exhausters.—It should not be necessary to urge that there should be two of these. However, a good many small works still endeavor to get along with one. Good, second-hand exhausters of the small size needed in these plants can often be picked up at a very moderate cost. Steady, even running is vital, and two machines absolutely necessary for proper care and maintenance. Have the steam line to exhausters practically unaffected by other demands, and control the steam pressure by a good reducing valve set below the minimum boiler pressure. Keep a recording gauge on the boiler pressure always. Study your exhauster gas governors and do not leave them until they are right. Remember a good one only costs $40, so don't economize here in the vitals of your plant. When adjusted right let no one readjust levers or weights but the foreman, and then only with proper after-explanation.

Put a recording pressure gauge on both inlet and outlet of exhausters, and take every necessary precaution to insure the absolute reliability of these important daily records: If, after all possible care, the exhausters, through age and wear, pull irregularly at best, and you don't care to replace at once, investigate hydraulic main governors. These are good in any case and their low cost and reliability may surprise you. A 6 inch governor will handle 36 retorts very satisfactorily.

Condensing and Scrubbing.—Even to-day among small works it is easier to find one without a single thermometer, except perhaps at the meter, than one with a full equipment. This is not right. Put a thermometer at the outlet of every piece of apparatus, and at the inlet of the boxes in addition. If you can't afford the best at least you can the 25-cent dairy instrument in an iron pipe, and this, if previously checked against one good instrument, does fair work. Put a pressure gauge at the same points, turned off when not being observed. Proper condensing is a matter of time and temperatures. Study your apparatus under all conditions. Note your temperature and how much water you use. Have visible water inlet or outlet wherever water is used. A water meter on condenser is good, and a dumping bucket on the scrubber, which, of course, can be home-made. Aim to keep your temperatures as nearly perfect as possible; 120° to 115° at the P. and A., 60° at the scrubber inlet. Don't be afraid to use the hydraulic main as a primary condenser if you have to. If you need new apparatus, lay out a simple but effective plan and work gradually to it. A good arrangement is: Primary condenser; exhauster; P. and A.; secondary condenser; washer; scrubber.

The washer can be omitted but, if used, put it after the condenser, and if not so now, change it. The primary condenser can be out-of-doors, and should be designed for both air and water cooling, thus allowing the extreme range from cold water to hot water with air between. The other apparatus can be placed in any spare corner, or one end of the retort house. Figure your own condenser and scrubber sizes, and any boiler works can make them for you, and you need not find them expensive pieces of apparatus. A fair rule for primary condenser is to allow 2 square feet of tube area per 1,000 per day and 2 minutes tube contact, or a flow of 10 feet per minute up the tubes in a 20-foot condenser, and for the secondary condenser 3 square feet of tube area and 1 to 1½ minutes' contact. The scrubber shell is comparatively cheap; make it tall and generous. Because you may not be able to profitably recover ammonia do not let the amount in your finished gas be a matter of indifference to you. Aside from the question of a reasonable standard of purity, your meters will in time object even if you do not, and the final expense will be considerable.

The point is that a good condensing outfit need not necessarily involve expensive machinery in an expensive building. P. and A.'s are cheap and are valuable in small works. Make your own scrubber trays and use nothing but wood, 6-inch boards on end, spaced 1 inch apart and bound in convenient bundles. Don't spend money on large cast iron connections; 8 and 6-inch screw pipe is ample for any small works and can be cheaply installed. With this you can use ordinary threaded valves, outside screw and yoke. Changes and additions made along these lines will cost far less than you think; so, don't put up too long with inefficient apparatus.

Purifiers and Meter.—Heat your gas up a little, say to 80° for purifying. Steam introduced directly into the gas after the scrubber is all right, if it does not make the oxide too wet, in which case keep the purifying house warmer or put coils in the boxes. Keep the station meter locked and seal up the keyhole. Be sure the pressure pipe to the overflow glass is connected to the inlet and not to the outlet of the meter.

General.—Plan out the simplest arrangement of steam, water and gas piping for your works, and make one good job of overhauling, after which allow no piping to be run except from the right point connected in the right way. In steam piping use a valve at every branch; choose a good valve with removable disk and stick to it. Keep the works clean and have plenty of light in the daytime and enough at night. Don't be afraid to cut a few extra windows; also, removable glass doors in the roof are excellent for both light and ventilation.

Records.—Besides the usual reports, have a special record made at

least four times a day of all thermometers, pressure gauges, station meter, holders, water and other meters, not only for information itself, but for checking back when anything looks wrong.

Inspection.—Get a good foreman and let him run the works, but you should run him. The works is, as already admitted, but one of your numerous daily responsibilities, and must receive as effective personal care and attention as any other department. Once a day, therefore, make a thorough inspection, a tour of the works, with the foreman at your side. Examine the—

Draught on each bench by torch applied at middle sight hole.
Condition of furnaces, ash pan and pit.
Scale weight of coal, just weighed and recorded.
Air slides and heats.
Retorts and standpipes open for charging.
Temperature and pressures.
Tar test at outlet of P. and A. and secondary condenser.
Ammonia test at outlet of scrubber.
Sulphur tests. And, in fact, every changing condition in the works should thus be carefully gone over daily, the foreman's attention being called to anything wrong, especially to any apparent discrepancy from reports being turned in. The simple checking back on meter statements has been known to put new life into a poor night shift helped by a careless foreman. Investigate and poke around into everything and know absolutely yourself that things are right. Insist, of course, on good, honest results, and it is wonderful what you can do, with even only the average foreman, under the follow-up system. Don't omit this daily half-hour inspection, and occasionally dig in deeper, as in the test of standpipe pressures already suggested.

Quality.—Don't run a gas works, however small, without knowing the quality of your gas. Get a calorimeter and operate it yourself, or teach some reliable assistant; then have a test made daily of both the make and the gas in the holder, and never let up on your foreman until they both exceed 600 B.T.U. every day.

In Conclusion.—Just a word on this in closing. Too few of our smaller works are testing their gas. There is not much legislation yet on the subject, but that is no excuse for waiting. A complete calorimeter, properly installed with water tank, costs a little under $200. The manipulations are simple and, by using the U. G. I. computer, the result may be determined almost instantly. Any bright young man or woman can be trained in a short time to make reasonably accurate determinations. Persuade your owners to buy one. They can make no better investment. Used daily a calorimeter will go far toward securing you a good, steady yield of good gas. Your men will quickly learn to respect it. All the other checks and investigations are good, but this is the one thing that, in the late hours of night, they cannot fool. You and your owners talk much of good service and will willingly spend this much money, and more if necessary, in the homes of your customers, but good service begins with the gas. The best service and the fewest complaints are in good gas. You and your owners talk perhaps at times of needless legislation. Our friend, Mr. Dickey, spoke of this to us two years ago; but, remember, that he also spoke of legislating unto ourselves. Therefore, face squarely in your works without further delay this question of the daily and hourly quality of your product.

Cut out wholly from your works the unreliable, miscalled and frequently misused jet photometer. An open flame constantly burning is as good a tell-tale, and for the actual knowledge of quality that you must have, get and use a calorimeter. Clean coal gas of 600 B.T.U. is good and satisfactory, and no further test is necessary.

Rates for Industrial Purposes.

[Prepared by MR. S. E. WOLFF, of New York, for the Sixth Annual Meeting, Illinois Gas Association.]

It is probable that the following pages will contain nothing new for those who have kept in close touch with modern thought on the subject of rate making. On the other hand, there are perhaps some who have not had the opportunity or time to become familiar with this subject, which is rapidly approaching the dignity of a science. It is my purpose to bring to the attention of the latter the application of certain principles which underlie proper rates for gas, and are vital to the present inclination to make low rates for large, and supposedly desirable, business.

That a large proportion of the customers now on our books are unprofitable is well known. This condition is often the fault of past managements as, through lack of appreciation of important principles that underlie the making of rates, companies have been bound to rates that, for small quantities, are not only unprofitable but often involve actual loss; and because of which the prices on larger quantities cannot readily be fixed at a point that will be fair to the consumer and permit our competing with some other forms of light, heat and power.

Only a short time since, and within the memory of all here, a per capita sale of 4,000 cubic feet per annum was a high standard for cities in the Middle-West; but to-day 8,000 to 10,000 cubic feet per annum are sold in some cities. No small part of such increase has been effected in the immediate past by sales for industrial purposes.

It is apparent that the use of gas for such purposes now offers a most fertile field for endeavor in sales' promotion. It is, therefore, only natural that gas managers turn to these uses of gas for large immediate increases in output, exerting special efforts to make rates that will enable them to secure and hold this business, having in mind that, in the absence of any ill effect on load factors, increase in volume of sales presents an important, if not the most important, source of decreased cost and increased profits. What is desired to be accomplished may be briefly outlined, as follows:

To devise rates that, as nearly as possible, will yield a fair income above cost of service.

To remedy errors existing in any rates heretofore made and avoid their repetition—many present rates being based on inadequate information, or on misinformation.

To avoid the making of unjust rates which may reasonably subject their makers to adverse criticism, or of unwise rates which may affect revenues.

To place in effect rates based on sound economic principles that will withstand any attack, and which shall be so logical as to commend themselves to reason, especially that of public bodies exercising regulatory powers.

To build up output by adopting rates which will increase sales to users of large quantities.

Having accomplished these, uniformity, or at least approximate uniformity (cost of labor and material considered) would obtain in the rates of companies selling the same product in a common, general territory, and would be a long step toward avoiding such wide differences as to furnish material that might serve as a basis of attack on prices.

An apt arrangement of the principles involved in questions of rate making, under phases or headings, is found in the report of the Committee on Rates, at page 376 of the American Gas Institute "Proceedings," 1906, as follows:

"*Economic Desirability.*—Those rate-principles and conditions which, apart from any other considerations, will give the public the maximum service at the lowest price compatible with commensurate net earnings to the company.

"*Equity.*—Those principles which constitute true equity, individually and collectively, to all concerned.

"*Sociological Expediency.*—Those public conditions to which economics and equity must be subordinated.

"*Legality.*"

A comprehensive reading of that report and its important references is recommended to those who have time and inclination for a study of the subject of rate-making. There is not space in this paper to discuss in detail all of these phases, but as the terms are well defined they may herein be appropriately used.

Until a comparatively recent date, the gas fraternity has, in most instances, failed to appreciate the importance of economic desirability and of equity; or, if appreciated and understood, educational effort to a common understanding of them has been lacking. The importance of economic desirability and equity having been not well comprehended, we have, when making agreements not been logically expedient; consequently, sociological expediency has been the dominant factor in the making of rates for gas in the past.

As the legality of any rate schedule will depend on the contract conditions and statutes under which an undertaking is operating, it is recommended that the legality of any proposed schedule of rates be carefully considered by those fully conversant with local conditions, as well as by those possessing expert knowledge of the subject. The following will, however, be found generally true:

"That, in the absence of contract provisions to the contrary, there may be made for gas in large volumes lower prices than those ruling for smaller users, provided such lower prices are based on the cost of service, and to some extent on the value of such service to the consumer, which value may be measured by the cost to him of substitutes for our service."

The three best known methods of charging for gas service are:

I. A uniform rate per unit of gas delivered.

II. A sliding scale rate per unit of gas delivered, the price per unit decreasing as the number of units delivered to one customer increases.

III. The so-called "Readiness-to-Serve" method.

None of these methods, as applied, has in all instances been entirely satisfactory either to the companies or to their customers. In some instances, with methods I. and II., there has been included a part of method III. in the form of a monthly or annual meter rental, service charge or minimum bill and, in at least one instance, of a combination of two of these.

Method I. is unsatisfactory because it is based on unsound economic principles, and is unfair both to the company and its customers, since that part of the cost of service not proportional to output forms no part of the basis of charge, except as it is distributed over the whole number of units delivered to all customers. This has resulted in placing on the books much business that is actually unprofitable and which is carried at the expense of profitable business. It has prevented desirable reductions in price to those customers who are in justice the only ones deserving reductions—*i. e.*, those who not only pay all the costs of their own service, but yield the profit that enables the company to carry the losses incident to serving unprofitable patrons.

Method II., when based on a curve of the cost of service and influenced by the value of that service to the customer, has been, and likely will remain, more nearly satisfactory, both to the companies and their customers than either of the other methods. A virtue of this method is that it is quite easily explained and as easily understood by the layman. The chief source of objection to rates formulated in accordance with this method is due to a lack of understanding of the principles involved, with resultant error in conclusions as to their desirability and equity.

Method III. has been vigorously assailed and as warmly defended. Opinions concerning it widely differ. It has been found wanting in certain particulars and has failed of adoption, except in a few instances. Its underlying principle is perhaps correct, but it is extremely hard to explain the method to a customer, and it has never been generally adopted, with the exception, possibly, of its application to electric power rates. As applied to gas, it has been used only as an alternative—optional with the consumer—to rates based on other methods.

To determine the economic desirability and equity of rates, the first important work comprises a segregation of the cost of service which should take full cognizance of all elements of cost involved in furnishing service to customers. These costs include all expenses incident to conducting the business, namely, operating expenses, including consumption of capital—*i. e.*, depreciation and fixed charges, including taxes and charges for the use of capital. The segregation of costs will be peculiar to each case, but there are a number of methods now in use for doing this, all of which may now be said to be on trial. Further reference to these is omitted as there is not space for their discussion. A comprehensive segregation of customers' accounts, for one or more years, is information essential to proper rate making. This may be made in such detail as is desired and necessary for each particular case.

In the correspondence preliminary to the decision to present this paper, its scope was touched on, and when it was proposed to confine it to the making of rates for large volumes your President stated that such a paper would be acceptable, "provided you have a logical defense against charges of discrimination." With the foregoing in mind, it was determined to present an account of what was done by one company in its effort toward making rates for large volumes to meet competition of other forms of energy without exposing itself to any imputation of unjust discrimination in its charges to customers; and in this connection I may say that, by those who have endeavored to establish rates with some reference to the principles herein named, it will be appreciated that to secure absolute equity for every consumer is impracticable, but that to secure something approximating this condition is not wholly impossible. The following is the segregation of costs made by the undertaking mentioned:

	Capacity.	Output.	Consumer.	Total.
Manufacture after deducting leakage	$4,748.02	$38,284.00	$.....	$43,032.02
Leakage	637.79	1,093.35	1,305.96	3,037.10
Distribution and commercial expense	326.05	8,598.22	12,486.72	21,410.99
Total	$5,711.86	$47,975.57	$13,792.68	$67,480.11
General expense	847.68	7,124.17	2,048.08	10,019.03
Total operating expense	$6,559.54	$55,099.74	$15,840.76	$77,500.04
Carrying cost, including interest, depreciation, taxes on fixed capital	7,634.80	37,500.68	34,250.72	70,385.60
Carrying cost, including interest, taxes on working capital	....	8,470.66	....	8,370.66
Total cost of service	$14,194.34	$101,070 48	$50,090.48	$165,356.30

In the above the cost of leakage has been apportioned as follows:

Capacity	21 per cent.
Consumers	36 "
Output	43 "

The totals of all expenses, except general expense, were footed, and the latter apportioned *pro rata* in the ratio that the expense in each division bore to the total expense. The carrying costs on reproduction value of physical property were apportioned as follows:

On "Works Investment," all to "Output."

The carrying cost of the excess investment in mains larger than 4-inch, above the carrying cost of an equal length of 4-inch main, was apportioned to "Capacity."

The carrying cost of 4-inch mains, plus the difference between the cost of larger mains and the cost of an equal number of feet of 4-inch mains, was apportioned to "Consumer." The reasons for this are as follows:

The average size of mains of the company is approximately 5-inch. If the maximum daily output were equally apportioned between each of the 24 hours, the company would require mains of an average size of approximately 3.8-inch, and to secure this capacity commercially would require the installation of 4-inch mains.

Services, all to "Consumers." Fuel connections, all to "Consumers." Meters treated in a manner similar to mains. Paving over mains and services was apportioned in the same ratio that the mains and services were apportioned.

Working "Capital," all to "Output."

This Company makes the same rate for light and fuel. It had during the year an average of 5,760 customers; the sales were approximately 180,000,000 cubic feet.

Capacity and consumer cost were combined and divided by the average number of consumers, designating the result as an annual "Customer Charge," which equaled $11.16, or 93 cents per month. The output costs were, of course, divided by the sales, and equal 56.15 cents per 1,000. Parenthetically, it may be noted that by this method charges for maximum demand are merged in the "Customer Charge." Whether or not this is proper is an open question. Another method for doing it would be to increase the "Customer Charge" according to the size of the meter installed. This would, however, if applied to every instance, be hardly more equitable than the method above employed. Based on the costs given, the Company should have been able to charge its customers as follows:

Monthly Consumption.	Customer Charges per 1,000.	Gas per 1,000.	Total per 1,000.
1,000	$0.93	$0.5615	$1.4915
2,000	0.4650	0.5615	1.0265
3,000	0.31	0.5615	0.8715
4,000	0.2325	0.5615	0.7940
5,000	0.186	0.5615	0.7475
10,000	0.093	0.5615	0.6545
20,000	0.0465	0.5615	0.6080
30,000	0.031	0.5615	0.5925
40,000	0.02325	0.5615.	0.58475
50,000	0.0186	0.5615	0.5801
100,000	0.0093	0.5615	0.5708

as against this the Company's rates established by ordinance are as follows:

2,000 feet per month, or less, $1 per 1,000 net.
More than 2,000 feet, 90 cents per 1,000 net.

It may be noted from the foregoing table that customers using less than 2,800 feet per month do not return to the Company the actual cost of serving them. Recently net rates were adopted by this Company as follows:

	Light and Fuel Service per 1,000.	Industrial Service per 1,000.
(a) Min. bill, per meter, per month	$0.50	$0.50
(b) 2,000 or less, per month	1.00	1.00
(c) 2.1 to 20,000 per month	0.90	0.90
(d) Next " "	0.85	0.8075
(e) " " "	0.80	0.76
(f) " " "	0.75	0.7125
(g) " " "	0.70	0.6650
(h) " 100,000 per month	0.65	0.6175
(i) In excess of 200,000 per month	0.65	0.5850

In the apportionment of the loss on consumers served at less than the proper ratio of return for service, two elements entered:

(a) The value of the service to the consumer.

(b) An effort to equitably divide this loss among profitable consumers.

These rates are named only to customers who execute a written contract. In contracts at industrial rates, consumers agree not to use gas for industrial purposes during peak load hours, except with the written consent of the Company, which consent it may withdraw upon short notice. No claim is made that this method is absolutely equitable or correct, and it no doubt embodies some errors of judgment. However, if this paper gives assistance to any, or is the means of creating discussion which will tend to clear up any uncertainties, the writer will feel himself repaid.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 10 cents.

954,454. Gas Separator. W. McArthur, Tenino, Wash.

954,557. Gas Stove. A. C. Witman, Columbus, O.

954,702. Burner. D. O. Rose, New York city.

954,779. Lamp. F. A. Cameron, Chicago, Ills., assignor to G. Bohner, same place.

954,783. Safety Device for Gas. R. H. Cowdrey, Chicago, Ills.

955,002. Combined Gas and Electric Fixture. A. I. Schwinger, New York city, assignor of one-third to S. Schulein and one-third to S. Braunstein, same place.

955,067. Apparatus for Treating Burner Gases. J. B. F. Herreshoff, New York city, assignor to General Chemical Company, same place.

Items of Interest
FROM VARIOUS LOCALITIES.

THE Cruse-Kemper Company has been awarded the contract for the construction of a 75,000-cubic foot storage holder on the works of the Port Jervis (N. Y.) Light, Heat and Power Company. The vessel will be arranged for future telescoping.

"A. J. R.," writing to the JOURNAL, under date of the 15th inst., says: "In your issue of the 11th inst. you refer to the good work being done by Mr. L. P. Boyle, of Chicago, in his capacity as Receiver of the City Gas Company, of Washington, Ind. Mr. Boyle is certainly doing all he possibly can to get this plant on a paying basis within the shortest possible space of time. In addition to the new benches of 4's a specimen of Little's patent hydraulic main governor has been installed."

A FURTHER hearing was held before the Public Service Commission, Second New York District, the morning of the 14th inst., on the application of the promoters of the South Shore Gas Company, who ask authority to begin construction work under the franchises granted recently to the Company to supply gas in the villages of Amityville, Farmingdale and Babylon, Long Island. The Company petitions to issue capital stock in the amount of $50,000, of which amount $25,000 is to be emitted forthwith, to execute a mortgage for $150,000 and to issue bonds thereunder in the amount of $150,000. Mr. H. Allen Odell appeared for the Company as to its financial needs and desires and Mr. Edwin E. Witherby testified as to the detailed costs of construction work.

IN the course of his annual message to the city Mayor Ingledue, of Marshaltown, Ia., advocated strongly the purchase of the local gas and electric lighting plants for operation on municipal account.

WE understand that the Messrs. Wood, of Millville, N. J., and Philadelphia, Pa., are considering the purchase of the plant at Bridgeton, N. J. This would undoubtedly mean that a new works for the supply of gas in adequate quantity to the district, which includes Bridgeton, Vineland, Leesburg, Port Norris, etc., would be constructed. It looks a wise move all round.

M. JOHN CONNORS, who entered the service of the Rahway (N. J.) Gas Light Company in 1863, and who served it in various capacities since, or until taken ill a few days ago, died at his home in that city the night of the 14th inst. He was in his 75th year, and is survived by one son, also a resident of Rahway.

THE Krause Chandelier Works Company, to manufacture gas and electric fixtures, has been incorporated by Messrs. Frank C. McKinney, Wm. Huck, Jr., and Joseph Gerradt. The designated place of business is Newark, N. J., and it is capitalized in $100,000.

MR. GEORGE WEBSTER, who recently resigned his position with the Consolidated Gas and Electric Company, of Youngstown, O., to engage in business on his own account, received the surprise of his life some evenings ago. The occasion of his perturbation was the presentation to him of a diamond ring on behalf of his former associates.

THE Gas Machinery Company, of Cleveland, O., has placed working examples of its well-known retort house governors in the following gas plants: Cairo, Champaign, Danville, Decatur and Galesburg, Ills.; Albion, Hillsdale and Monroe, Mich.; Clinton, Ia.; Columbus, Ind.; St. Louis, Mo., and Montreal, Canada.

WORK on the main system for the Plymouth County (Mass.) Gas and Power Company will be underway by the 1st prox. Possibly the start in this respect will be made in East Braintree section of the territory which the Company proposes to cover.

THE proprietors of the Rector Gas Lamp Company are constructing a factory building in Passaic, N. J., on Main avenue, close to the structure occupied by the Peoples Bank.

THE Westchester (N. Y.) Lighting Company has been awarded the contract for the illumination of Glen Island, which summer resort is to be operated as a breathing ground for the residents of New York, with a series of attractions even greater than those which made it such an attractive spot in the times of the Starin dynasty. Incandescent electric lamps will be mainly used, and the number maintained will go well into the thousands.

"B. S. T.," writing from Newton, N. J., under date of the 15th inst., forwards the following: "The annual meeting of the Newton Gas and Electric Company resulted in these changes in the official management: Mr. Lewis S. Iliff was elected President to succeed Mr. William McKenzie, of Carlton Hills, N. J.: Mr. F. Thorpe, of New York, was named Vice-President, succeeding Mr. A. L. Prescott, of New York; Mr. George P. Mathews was elected Secretary, replacing Mr. Frank Hughes, of Passaic; and Mr. R. W. Meyers, of New York, was re-elected Treasurer. Residents of this place now are in a majority on the Board of Directors."

PRESS despatches, from Baltimore, under date of the 18th inst., state that while there has been no official announcement as yet on the subject, plans have been pretty well matured for the retirement of $3,584,000 of the first mortgage 6 per cent. bonds of the Consolidated Gas Company, which expire on July 1. It is practically certain that the Directors at the next meeting will decide to retire those bonds by an issue of Consolidated Gas Company 4½ per cent. bonds, which will be either sold or exchanged for the outstanding bonds at the pleasure

of the holder. The Gas Company's 4½ per cent. bonds are now selling around 90 on the Baltimore market.

THE fraternity will sorrow with Mr. A. T. Rand, President of the Minneapolis (Minn.) Gas Light Company, in the death of his estimable wife, whose demise occurred at her home, Vine and Franklin streets, the 9th inst. The funeral services were held the afternoon of the 11th inst., the Rev. J. E. Bushnell officiating. Interment was made in Lakeview Cemetery.

MR. CHARLES B. HEALY has been appointed Cashier for and to the Woonsocket (R. I.) Gas Company.

THE Suburban Gas and Fuel Company, of York county, Dallastown, Pa., has been incorporated to supply gas to the residents of the boroughs of Dallastown, Red Lion, Windsor, Yoe and adjoining townships. This section will afford plenty of profitable work for an up-to date Company. The initial capitalization is $5,000.

THE contract for the lighting fixtures for the new Court House in Queens county, L. I., has been awarded to the Mitchell-Vance Company, at its bid of $6,885.55—which seems a remarkably low one.

THE Spokane Falls (Wash.) Gas Light Company has closed a contract with the New York Improved Equipment Company for the construction of 8 benches of 6's. General Manager Cantril declares that the distributing force is continually on the jump preparing for main extensions into new districts. In fact, in this respect it is not unusual for the Company to receive 6 or more requests, from the inhabitants of as many districts, each day for an extension of mains.

THE proprietors of the Elmer P. Morris Company inform us that they are erecting a large factory for the manufacture of their specialties (lamp posts and lighting specialties for exterior work) in Elizabethtown, Pa. Upon its completion the present foundry, at Newark, N. J., will be closed.

"GENERAL MANAGER HEWITT, of the Consumers Company, of Toronto, is certainly going after new business in a way that is bound to appeal to the residents;" so writes a correspondent in that city who, writing under date of the 15th inst., incloses the following further mention: "Believing that a satisfied customer is the best advertisement, and that thousands of dollars are wasted annually by stoves using more gas than is necessary, because of imperfect adjustments or need of cleaning, the Company is now undertaking, not only to supply gas ranges to the middle class of people in the city at moderate prices, giving time for payment, but to periodically inspect them free of charge. An inspector will go around four times a year, as long as the customer keeps the range, to clean out the burners and regulate the adjustments, so as to secure the maximum of heat for the gas consumed."

MR. J. J. DAWES, formerly at Rockford, Ills., has been appointed Commercial Manager of the Corning (N. Y.) Gas and Electric Company.

WE herewith chronicle the death of Mr. Gardner Morse, for many years Secretary of the New Haven (Conn.) Gas Light Company, who passed away in the home of his sister (Mrs. William F. Tuttle), Rutland, Vt., the afternoon of the 13th inst. Mr. Morse was for a long period Secretary of the New Haven Gas Light Company. If we mistake not, he became attached thereto in a subordinate position in the spring of 1869, and about 5 years later became its Secretary, to which position he declined a re election, we believe in 1904. His immediate survivors are two brothers, Elliot and Julius, and two sisters—Mrs. William F. Tuttle and Mrs. William Corbin, of New Britain, Conn. He was a graduate of the Hopkins Grammar School. The funeral services were held in Trinity Church, New Haven, the afternoon of the 15th inst., the Rev. Charles O. Scoville, officiating.

THE Directors of the Baltimore Consolidated Gas and Electric Light Company have declared a semi-annual dividend of 2 per cent., out of the earnings of the Company, for the half year ended the 31st prox. The stock has been selling around 45 to 50 for the past 6 months.

THE employees of the fitting department of the New Haven (Conn.) Gas Light Company have formed a benefit association. The officers elected are: President, Roger Bruce; Vice-President, David Blaikie; Secretary, Frederick L. Allen; Treasurer, Morris Buell; Entertainment Committee, James Bruce (Chairman), W. J. Murphy and Wm. Saunders. The organization starts out with possibly 50 members.

THE Myers Gas Generator Company, of Buffalo, N. Y., has been incorporated by Messrs. C. H. Myers, P. L. Marvis and John H. Schumacher, all residents of Buffalo. The Company is capitalized in $3,500,000, and it is to act as a holding Company, to back other companies to be formed throughout the country; the purpose is to manufacture and market producer gas generators manufactured under a series of Letters Patent, granted at divers times to Mr. Chas. H. Myers.

THE Gas Engineering Company, of Trenton, N. J., has just installed, for the Granite City (Ills.) Gas Company, a water gas apparatus, equal to the production of something over 500,000 cubic feet per day. The equipment includes a Root's Company exhauster, and up-to-date condensing, washing and purifying apparatus. An illustration of the works will be shown in the advertisement of the Engineering Company in our issue of May 2d.

HENRY NOTTHOFF recently sued the Los Angeles (Cal.) Gas and Electric Corporation for damages, alleging contributory negligence on the part of the defendant, which negligence abetted his falling into a sump-hole filled with hot water, on a certain date (July 5, 1907), while in the performance of his duties as Chief Engineer in charge of the Company's electrical station. The first Court granted a motion for non suit, and the District Court of Appeal, to which tribunal Notthoff subquently appealed for a reversal, has just affirmed the action of the lower Court.

AT a special meeting, convened in Wilkes-Barre, Pa., the 16th inst., the proprietors of the Wilkes-Barre Gas and Electric Company, the Parsons Electric Light Company, the Anthracite Heat, Light and Power Company and the Wilkes-Barre Heat, Light and Motor Company, were merged and will hereafter be operated and managed by the Susquehanna Heat, Light and Motor Company. This concern is capitalized in $20,000,000, which sum should keep it going along for quite a while.

SINKING fund purchases of the first 5's of the Suburban Gas Company, of Philadelphia, will be made to-day to the extent of $7.80, at a price not to exceed 108 and interest.

THE annual meeting of the Denver (Col.) Gas and Electric Company will be held in Denver the 10th prox.

"A VERY enjoyable occasion was the banquet of the Commercial Club of the Boston Consolidated Gas Company, which was held in the Revere House, the evening of the 14th inst. The guests were Mr. W. W. Cummings and Mr. R. C. Ware, of the Company. Several informal speeches were made, and there was not a dull moment during the time of the banquet and the proceedings that terminated it.—R. F."

"B. R. M.," writing under date of the 15th inst., forwards this mention: "After many years of speechifying over the matter, Sea Isle City, N. J., is to have a gas plant. The ordinance carrying the necessary consent has been approved and accepted. The corporation authorized to carry on the work is the Citizens Gas Company, of Sea Isle City, which undertakes to supply gas at a rate not to exceed $1.50 per 1,000 cubic feet, gas for street lighting to be $1.25, and gas in a certain quantity to be furnished free to the public buildings. Work on construction account is to be undertaken at once. These people, I unreservedly say, are reliable."

MR. H. D. TURNEY, President of the Columbus (O.) Gas and Fuel Company, is home again. Accompanied by Mrs. Turney, they have just completed a pleasure trip to Panama, thence to South Africa and back.

THE Minneapolis (Minn.) Gas Inspector, Mr. A.D. Meeds, is finding every day stronger proof that the Minneapolis Gas Company is well exceeding, both as to illuminating value and heat unit availability, the statutes governing such supply. For instance, during the first 9 days of this month the illuminating value (average of 27 tests) equaled 23.22 candles; and the heat unit value averaged 614.49. The franchise stipulation in each respect is 18 and 600.

THE new Woodstock (Ills.) Gas Company has 175 connections made to the mains, which number will undoubtedly reach 300 before July 1st.

ON the 11th inst., Mr. J. A. Perkins, formerly of Richmond, Ind., assumed his new duties as Superintendent of the plant at Bloomington, Ills.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHARLES H. WADELTON,
MANAGER.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 42 Pine Street, New York.
Telephone, 2996 John.

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance, Single copies, 10 cents.

The JOURNAL is the official organ of the NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

AGENTS:

New York—American News Company, 39 and 41 Chambers street.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime street, London.

MONDAY, APRIL 25, 1910.

The Market for Gas Securities.

Consolidated, as a net return in the trading for the week, is 3½ points off in the bid price, the quotation being 141 to 141½, at the opening to-day (Friday). One would be inclined to think, under a normal condition of mind that, after an equitable settlement with the city, over accounts running to a period of 8 years, and involving millions of dollars, that at least steadiness would prevail. However, between the jollity at Washington and the pious zeal displayed in Albany the investor is certainly between the rungs of the ladder, rather than on them. Intrinsically, however, the mere settlement of those open accounts with the city has added at least 20 points to the value of Consolidated whether or not that value is recognized in the lane just south of Pine street.

Other quotations show little change. One, however, might be justified in calling attention to the slow but certain advance that is being registered in the securities of the Massachusetts Gas Companies.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

APRIL 25.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$73,177,000	100	141	141½
Central Union Gas Co. —				
1st 5's, due 1972, J. & J.	3,000,000	1,000	98	101
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual Gas Co.	3,600,000	100	155	165
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	100	101½
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	35	50
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	98½	100½
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	104	107
Con. 5's, due 1945, J. & J.	1,500,000	—	97	101
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	94	100
Standard	5,000,000	100	—	75
Preferred	5,000,000	100	70	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	148	150
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106½	107
Yonkers	200,650	500	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	.65	.70
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	65
" 1st Mtg. 5's	509,000	1,000	90	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	73	73½
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,660,000	1,000	104	106¼
Cincinnati Gas and Electric Co.	20,500,000	100	92	93
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	90½	91
Preferred	3,026,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	—	105
Mortgages, 6's	3,600,000	-	—	115
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	458,000	—	102	105
Detroit City Gas Co	5,000,000	50	—	50
" Prior Lien 5's	4,619,000	1,000	97	100½
Detroit Gas Co., 5's	381,000	1,000	75	80
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	39	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	112	113½
" Bonds, 5's	10,500,000	—	108	108¼
Indianapolis	2,000,000	—	60	70
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede Gas Co., St. Louis.	10,000,000	100	102½	102¾
Preferred	2,500,000	100	90	95
Bonds	10,000,000	1,000	102½	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas and Electric Co.				
" 1st Mtg. 6's	350,000	1,000	106	106¾
" 6 per cent. scrip, due 1910	100,000	25	60	60½
Massachusetts Gas Companies, of Boston	25,000,000	100	78½	79
Preferred	25,000,000	100	92	92¼
Montreal Gas Co., Canada	2,000,000	100	218	218¾
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
Bonds, 6's	6,000,000	—	137	138
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	110½	110¾
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104½	105½
San Francisco Gas Co., Cal.	15,500,000	—	—	—
St. Joseph Gas Co.—				
1st Mtg. 5's	751,000	1,000	100	102
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgages, 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	90	95
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	100	104
Washington (D. C.) Gas Co.	1,600,000	200	352½	—
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	361	—

Advertisers' Index.

New advertising, or changes in standing ads., to assure attention the issue following their reception, must be in hand on Wednesday.

AMMONIA CONCENTRATORS.
Bartlett-Hayward Co., Baltimore, Md. 833
Fred Bredel Co., Milwaukee, Wis. 830
Michigan Ammonia Works, Detroit, Mich. 812
The Gas Machinery Co., Cleveland, O. 815
Western Gas Construction Co., Fort Wayne, Ind. 840

BURNERS.
Wm. M. Crane Co., New York City. 824

CANNEL COALS.
Perkins & Co., New York City. 830

CEMENTS.
C. L. Gerould, New Castle, Pa. 828
Ernst Strassburger, Chicago, Ills. 828
Laclede-Christy Clay Products Co., St. Louis, Mo. 818

CHARGING BARROWS & COAL WAGONS.
Davis & Farnum Mfg. Co., Waltham, Mass. 833
Kerr Murray Mfg. Co., Fort Wayne, Ind. 834
The Stacey Mfg. Co., Cincinnati, O. 836

COKE CRUSHERS.
Bartlett-Hayward Co., Baltimore, Md. 833
C. M. Keller, Columbus, Ind. 831

COKE OVEN ENGINEERS.
Albert Ladd Colby, New York City. 812

CONVEYORS—ALL KINDS.
Bartlett-Hayward Co., Baltimore Md. 833
Brown Hoisting Machinery Co., Cleveland, O. 818
Cruse-Kemper Co., Ambler, Pa. 820
C. W. Hunt Company, New York City. 832
Fred Bredel Co., Milwaukee, Wis. 830
G. A. Bronder, New York City. 829
Kerr Murray Mfg. Co., Fort Wayne, Ind. 835
The Gas Machinery Co., Cleveland, O. 815
The Stacey Mfg. Co., Cincinnati, O. 835
Western Gas Construction Co., Fort Wayne, Ind. 840

EXHAUSTERS.
Connelly Iron Sponge & Governor Co., New York City 829
Connersville Blower Company, Connersville, Ind. 836
Davis & Farnum Mfg. Co., Waltham, Mass. 832
Isbell-Porter Company, Newark, N. J. 816
Kerr Murray Mfg. Co., Fort Wayne, Ind. 835
Piqua Blower Co., Piqua, O. 821
The P. H. & F. M. Roots Co., Connersville, Ind. 823

GAS AND WATER PIPES.
Davis & Farnum Mfg. Co., Waltham, Mass. 832
Donaldson Iron Co., Emaus, Pa. 824
R. D. Wood & Co., Philadelphia, Pa. 838

GAS BLAST FURNACES.
American Gas Furnace Co., New York City. 816

GAS COALS.
Berwind-White Coal Mining Co., New York and Phila. 830
Perkins Co., New York City. 830
Westmoreland Gas Coal Co., Philadelphia, Pa. 831

GAS COCKS.
H. Mueller Manufacturing Co., Decatur, Ills. 823

GAS ENGINEERS.
Albert Ladd Colby, New York City. 812
Bartlett-Hayward Co., Baltimore, Md. 833
Cruse-Kemper Co., Ambler, Pa. 820
Davis & Farnum Mfg. Co., Waltham, Mass. 832
Drakes Limited, Halifax, England. 813
Edwin E. Witherby, New York City. 812
Evens & Howard Firebrick Co., St. Louis, Mo. 743
Frank D. Moses, Trenton, N. J. 818
Fred Bredel Co., Milwaukee, Wis. 830
Frederick J. Mayer, New York City. 825
Henry I. Lea, Chicago, Ills. 838
H. M. Byllesby & Co., Chicago, Ills. 832
Humphreys & Glasgow, New York City. 832
Improved Equipment Company, New York City. 834
Isbell-Porter Co., Newark, N. J. 816
Kerr Murray Mfg. Co., Fort Wayne, Ind. 835
Laclede-Christy Clay Products Co., St. Louis, Mo. 818
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. 838
Quintard Iron Works, New York City. 821
R. D. Wood & Co., Philadelphia, Pa. 837
The Gas Machinery Co., Cleveland, O. 815
The Stacey Mfg. Co., Cincinnati, O. 835
The United Gas Improvement Co., Philadelphia, Pa. 857
Western Gas Construction Co., Fort Wayne, Ind. 840
William A. Baehr, Chicago, Ills. 812
William W. Randolph, New York City. 864

GAS ENRICHERS.
Standard Oil Co., New York City. 831

GAS GAUGES.
The Bristol Co., Waterbury, Conn. 854

GAS GOVERNORS.
Chaplin-Fulton Mfg. Co., Pittsburg, Pa. 809
Connelly Iron Sponge & Governor Co., New York City. 829
Evens & Howard Firebrick Co., St. Louis, Mo. 743
Isbell-Porter Co., Newark, N. J. 816
Pittsburg Meter Co., East Pittsburg, Pa. 818
Reynolds Gas Regulator Co., Anderson, Ind. 859

GASHOLDERS.
Bartlett-Hayward Co., Baltimore, Md. 833
Chicago Bridge and Iron Works, Chicago, Ills. 824
Cruse-Kemper Co., Ambler, Pa. 820
Davis & Farnum Mfg. Co., Waltham, Mass. 832
Deily & Fowler Mfg. Co., Philadelphia, Pa. 836
Kerr Murray Mfg. Co., Fort Wayne, Ind. 835
R. D. Wood & Co., Philadelphia, Pa. 838
Riter-Conley Mfg. Co., Pittsburgh, Pa. 849
The Stacey Mfg. Co., Cincinnati, O. 835
Western Gas Construction Co., Fort Wayne, Ind. 840

GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., New York City..... 831

GAS METER CONNECTIONS.

H. Mueller Manufacturing Co., Decatur, Ills..... 823

GAS METERS.

American Meter Co., New York and Philadelphia..... 839
D. McDonald & Co., Albany, N. Y..... 839
Helme & McIlhenny, Philadelphia, Pa..... 839
John J. Griffin & Co., Philadelphia, Pa..... 768
Keystone Meter Co., Royersford, Pa..... 838
Maryland Meter and Mfg. Co., Baltimore, Md..... 838
Metric Metal Co., Erie, Pa..... 839
Nathaniel Tufts Meter Co., Boston, Mass..... 838
New York Improved Meter Co., New York City..... 838
Pittsburg Meter Co., East Pittsburg, Pa..... 822
Rotary Meter Co., New York City..... 837
Sprague Meter Co., Bridgeport, Conn..... 837

GAS PLANT TOOLS.

H. Mueller Manufacturing Co., Decatur, Ills..... 823

GAS STOVES.

American Meter Co., New York and Philadelphia..... 839
Keystone Meter Co., Royersford, Pa..... 838
Maryland Meter & Manufacturing Co., Baltimore, Md... 838
Nathaniel Tufts Meter Co., Boston, Mass..... 838

GAS TAPPING MACHINES.

George Light, Dayton, O..... 831
H. Mueller Manufacturing Co., Decatur, Ills..... 823

GAS WORKS APPARATUS AND CONSTRUCTION.

Bartlett-Hayward Co., Baltimore, Md..... 833
Connelly Iron Sponge & Governor New Co., York City. 829
Cruse-Kemper Co., Amber, Pa..... 820
Davis & Farnum Mfg. Co., Waltham, Mass..... 832
Deily & Fowler Mfg. Co., Philadelphia, Pa..... 823
Evens & Howard Firebrick Co., St. Louis, Mo..... 743
Fred Bredel Co., Milwaukee, Wis..... 830
Gas Engineering Co., Trenton, N. J..... 818
Humphreys & Glasgow, New York City..... 832
Improved Equipment Company, New York City..... 834
Isbell-Porter Co., New York City..... 816
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 835
Laclede-Christy Clay Products Co., St. Louis, Mo..... 818
Lloyd Construction Co., Detroit, Mich..... 842
Quintard Iron Works Co., New York City..... 821
R. D. Wood & Co., Philadelphia, Pa..... 838
Riter-Conley Mfg. Co., Pittsburgh, Pa..... 819
The Gas Machinery Co., Cleveland, O..... 815
The Stacey Mfg. Co., Cincinnati, O..... 825
The United Gas Improvement Co., Philadelphia, Pa... 827
Western Gas Construction Co., Fort Wayne, Ind..... 840

HIGH PRESSURE GAS GOODS.

H. Mueller Manufacturing Co., Decatur, Ills..... 823

HOT WATER HEATERS.

Humphrey Co., Kalamazoo, Mich..... 822

INCANDESCENT GAS LAMPS.

General Gas Light Co., Kalamazoo, Mich..... 817
Welsbach Company, Gloucester, N. J..... 826

INCLINED RETORTS.

Baltimore Retort and Firebrick Co., Baltimore, Md... 828
Didier-March Co., New York City..... 825
Evens & Howard Firebrick Co., St. Louis, Mo..... 743
Fred Bredel Co., Milwaukee, Wis..... 830
Gas Bench Construction Co., St. Louis, Mo..... 821
Improved Equipment Company, New York City..... 834
Laclede-Christy Clay Products Co., St. Louis, Mo..... 818
Parker-Russell Mining and Mfg. Co., St. Louis, Mo... 828

MAIN AND SERVICE LAYING.

Sullivan Bros., Flushing, N. Y..... 830

PATENTS, TRADE-MARKS AND COPYRIGHTS.

Royal E. Burnham, Washington, D. C..... 831

PIPE LINE TOOLS.

H. Mueller Manufacturing Co., Decatur, Ills..... 823

PREPAYMENT METER ATTACHMENTS.

New York Improved Meter Co., New York City..... 838

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia..... 839
D. McDonald & Co., Albany, N. Y..... 837
Helme & McIlhenny, Philadelphia, Pa..... 839
John J. Griffin & Co., Philadelphia, Pa..... 768
Keystone Meter Co., Royersford, Pa..... 838
Nathaniel Tufts Meter Co., Boston, Mass..... 838
New York Improved Meter Co. New York City..... 838
Pittsburg Meter Co., East Pittsburg, Pa..... 822
Sprague Meter Co., Bridgeport, Conn..... 837

PROCESSES.

Bartlett-Hayward Co., Baltimore, Md..... 833
Fred Bredel Co., Milwaukee, Wis..... 830
Humphreys & Glasgow, New York City..... 832
Improved Equipment Company, New York City..... 834
The Gas Machinery Co., Cleveland, O..... 815
The United Gas Improvement Co., Philadelphia, Pa... 827
Western Gas Construction Co., Fort Wayne, Ind..... 840

PRODUCER POWER PLANTS.

R. D. Wood & Co., Philadelphia, Pa..... 838

PURIFIER AND SCRUBBER TRAYS.

Bartlett-Hayward Co., Baltimore, Md..... 833
Cabot Mfg. Co., Hoboken, N. J..... 831
Western Gas Construction Co., Fort Wayne Ind..... 840

PURIFIERS.

Bartlett-Hayward & Co., Baltimore, Md..... 833
Connelly Iron Sponge & Governor Co., New York City. 829
Cruse-Kemper Co., Ambler, Pa..... 820
Davis & Farnum Mfg. Co., Waltham, Mass..... 832
Evens & Howard Firebrick Co., St. Louis, Mo..... 743
Isbell-Porter Co., Newark, N. J..... 816
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 835
Quintard Iron Works, New York City..... 821
R. D. Wood & Co., Philadelphia, Pa..... 838
The Stacey Mfg. Co., Cincinnati, O..... 825
The United Gas Improvement Co., Philadelphia, Pa... 827
Western Gas Construction Co., Fort Wayne, Ind..... 840

PURIFYING MATERIALS.

Connelly Iron Sponge & Governor Co., New York City 829
F. Behrend, New York City..... 824
The United Gas Improvement Co., Philadelphia, Pa... 827

REGENERATIVE FURNACES.

Baltimore Retort and Firebrick Co., Baltimore, Md.. 828
Bartlett, Hayward & Co., Baltimore, Md..... 833
Didier-March Co., New York City..... 825
Evens & Howard Firebrick Co., St. Louis, Mo..... 743
Fred Bredel Co., Milwaukee, Wis..... 830
Gas Bench Construction Co., St. Louis, Mo..... 821
Improved Equipment Company, New York City..... 834
J. H. Gautier & Co., Jersey City, N. J..... 828
Laclede-Christy Clay Products Co., St. Louis, Mo..... 818
Missouri Firebrick Co., St. Louis, Mo..... 823
Parker-Russell Mining and Mfg. Co., St. Louis, Mo... 828

RETORTS AND FIREBRICKS.

Baltimore Retort and Firebrick Co., Baltimore, Md... 828
Didier-March Co., New York City..... 825
Evens & Howard Firebrick Co., St. Louis, Mo..... 743
Fred Bredel Co., Milwaukee, Wis..... 830
Gas Bench Construction Co., St. Louis, Mo..... 821
Henry Maurer & Son, New York City..... 821
Improved Equipment Company, New York City..... 834
James Gardner, Jr., Co., Bolivar, Pa..... 826
J. H. Gautier & Co., Jersey City, N. J..... 828
Laclede-Christy Clay Products Co., St. Louis, Mo..... 818
Missouri Firebrick Co., St. Louis, Mo..... 823
Parker-Russell Mining and Mfg. Co., St. Louis, Mo.... 828

SCRUBBERS AND CONDENSERS.

Bartlett-Hayward Co., Baltimore, Md..... 833
Cruse-Kemper Co., Amler, Pa..... 820
Davis & Farnum Mfg. Co., Waltham, Mass..... 832
Evens & Howard Firebrick Co., St. Louis, Mo..... 743
Fred Bredel Co., Milwaukee, Wis..... 830
Isbell-Porter Co., Newark, N. J..... 816
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 835
Quintard Iron Works, New York City..... 821
R. D. Wood & Co., Philadelphia, Pa..... 488
Riter-Conley Mfg. Co., Pittsburgh, Pa..... 819
The Gas Machinery Co., Cleveland, O..... 815
The Stacey Mfg. Co., Cincinnati, O..... 825
The United Gas Improvement Co., Philadelphia, Pa... 827
Western Gas Construction Co., Fort Wayne, Ind..... 840

SELF-SEALING MOUTHPIECE DOORS.

Bartlett-Hayward Co., Baltimore, Md..... 833
Davis & Farnum Mfg. Co., Waltham, Mass..... 832
Fred Bredel Co., Milwaukee, Wis..... 830
Isbell-Porter Co., Newark, N. J..... 816
Improved Equipment Company, New York City..... 844
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 835
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 828
Quintard Iron Works, New York City..... 821
R. D. Wood & Co., Philadelphia, Pa..... 838
The Gas Machinery Co., Cleveland, O..... 815
The Stacey Mfg. Co., Cincinnati, O..... 835
Western Gas Construction Co., Fort Wayne, Ind..... 840

STOKING MACHINERY.

Fred Bredel Co., Milwaukee, Wis..... 830
G. A. Bronder, New York City..... 829
Laclede-Christy Clay Products Co., St. Louis, Mo..... 818
Parker-Russell Mining and Mfg. Co., St Louis, Mo. ... 828

STORAGE TANKS.

Bartlett-Hayward Co., Baltimore, Md..... 833
Davis & Farnum Mfg. Co., Waltham, Mass..... 832
Quintard Iron Works, New York City..... 821
The Stacey Mfg. Co., Cincinnati, O..... 835
Western Gas Construction Co., Fort Wayne, Ind..... 840

STREET LAMPS.

Thos. T. W. Miner, New York City..... 813
Welsbach Street Lighting Co., New York and Phila.. 826

TAR AND CARBONIC ACID EXTRACTOR.

Bartlett-Hayward Co., Baltimore, Md..... 833
Fred Bredel Co., Milwaukee, Wis..... 830
Isbell-Porter Co., Newark, N. J..... 816
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 835
The Gas Machinery Co., Cleveland, O..... 815
The Stacey Mfg. Co., Cincinnati, O..... 835
The United Gas Improvement Co., Philadelphia, Pa... 827
Western Gas Construction Co., Fort Wayne, Ind..... 840

VALVES.

Bartlett-Hayward & Co., Baltimore, Md..... 833
Davis & Farnum Mfg. Co., Waltham, Mass..... 832
Isbell-Porter Co., Newark, N. J..... 816
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 835
Ludlow Valve Manufacturing Co., Troy, N. Y..... 821
R. D. Wood & Co., Philadelphia, Pa..... 838
The Gas Machinery Co., Cleveland, O..... 815
The P. H. & F. M. Roots Co., Connersville, Ind..... 823
The Stacey Mfg. Co., Cincinnati, O..... 835
Western Gas Construction Co., Fort Wayne, Ind..... 840

VERTICAL S'S.

Connelly Iron Sponge & Gov. Co. (Drake's [Eng.] System) 829
Didier-March Co., New York City..... 825
Evens & Howard Firebrick Co , St. Louis, Mo..... 743
Fred Bredel Co., Milwaukee, Wis..... 830
Gas Bench Construction Co., St. Louis, Mo..... 821
Improved Equipment Company, New York City..... 834
Laclede-Christy Clay Products Co., St. Louis, Mo..... 818
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. .. 828

WATER METERS.

Pittsburg Meter Co., East Pittsburg, Pa..... 822

Utilize Your Gas Liquor.
NO EXTRA LABOR OR OPERATING EXPENSES.
IMPROVED AMMONIA CONCENTRATOR.
About 100 in use. Write to
STROH & OSIUS, Patentees, or
MICHIGAN AMMONIA WORKS, - Detroit, Mich.

WILLIAM A. BAEHR,
CONSULTING ENGINEER,
Commercial National Bank Building,
CHICAGO.
Also Representing
The Bartlett-Hayward Company.

EDWIN E. WITHERBY,
SPECIAL REPRESENTATIVE
GAS MACHINERY COMPANY,
CLEVELAND, O.,
Will advise on commercial engineering subjects and operation of gas and electric properties.
40 WALL STREET, - NEW YORK.

ALBERT LADD COLBY,
CONSULTING ENGINEER.
RETORT COKE OVENS
WITH OR WITHOUT
BY-PRODUCT RECOVERY.
165 BROADWAY, - NEW YORK,
AND
SOUTH BETHLEHEM, PA.

ANNUAL MEETING.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.

The Annual Meeting of the Stockholders of The United Gas Improvement Company will be held at the office of the Company, Northwest Corner of BROAD AND ARCH STREETS, PHILADELPHIA, on Monday, May 2, 1910, at 12 o'clock, noon, when an election will be held for a President and six (6) Directors to serve for the ensuing year, and such other business transacted as may be brought before the meeting. The stock transfer books will be closed from 3 P.M., Wednesday, April 20, until 10 A.M., Tuesday, May 3d.

1819-2 W. F. DOUTHIRT, Secretary.

Position Wanted
As Works Foreman.

Ten years' experience. Either coal or water gas plant. Would prefer position in Central West. Best of references.

1820-1 Address, "B. J, F.," care this Journal.

Position Wanted
By a Young Man as a Meter Repairer.

Understands repairing, testing and proving thoroughly.

1820-1 Address, - "REPAIRER," care this Journal.

WANTED,
A Good Stoker for Medium Sized Gas Plant.

Steady place for the right party. Must be sober. Married man preferred.

1817-tf Address, "L. L. G.," care this Journal.

Demonstrator.

Wanted at once by a Southern gas company, in a city of 25,000, a Southern lady, experienced in demonstrating the economical use of stoves and appliances, to make a house-to-house canvass for a term of six months or one year. Applicants are requested to furnish references and state experience and salary.

1818-tf Address, "G. L. C. C.," care this Journal.

WANTED,
A First-Class Draftsman, Accustomed to Gasholder Construction, Gas Apparatus and Structural Work.

State experience and salary expected.

1818-6 Address, "K. K.," care this Journal.

WANTED,
Superintendent for a Small Plant in South Jersey.

Must be thorough in operation of water gas plants and a good business getter. Wages, $1,000. Address, "POSITION,"

1820-1 Care this Journal.

WANTED.
FOUR DRAFTSMEN.

Experience on gas plant construction desirable. Good wages to competent men. Address, "C. M. W.,"

1818-3 Care this Journal.

Practical Handbook on

GAS ENGINES,
With Instructions for Care and Working of the Same,

By G. LIECKFELD, C.E.
Translated with Permission of the Author,
By GEO. M. RICHMOND, M.E.

Price, $1.

For Sale by
AMERICAN GAS LIGHT JOURNAL,
42 Pine St., New York City.

WANTED,
NEW BUSINESS MAN,

To make a quick, strong, new business campaign. Must have had complete charge of a gas company.

Address, "L.,"

1820-2 Care this Journal.

WANTED,

Man who has had charge of a gas company, to take position of superintendent of distribution in a large plant. Address, "J.,"

1820-2 Care this Journal.

FOR SALE,

One set of 4 purifying boxes 12 feet 8 inches by 10 feet 9 inches by 3 feet, in good condition, with centerseal and 10-inch connections.

1771-tf YORK GAS CO., York, Pa.

FOR SALE,
GAS AND ELECTRIC PROPERTIES AT CHAMBERLAIN, S. D.

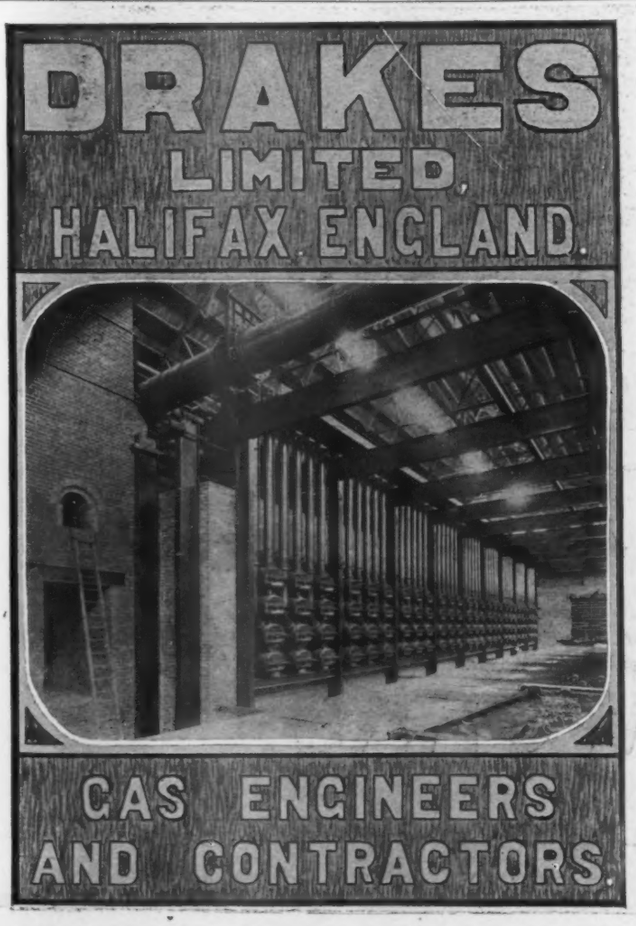
Address inquiries to J. W. SANFORD,

1820-2 CHAMBERLAIN, SOUTH DAKOTA.

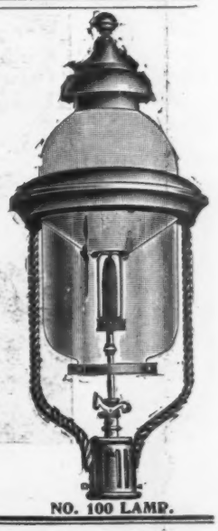
FOR SALE,

One Relief Holder, 60,000 capacity, tank 62 feet 6 inches by 21 feet; holder, 60 feet by 21 feet. Built by Bartlett & Hayward, 1888. WASHINGTON GAS LIGHT CO.,

1820-4 WASHINGTON, D. C.



"THE MINER"
GLOBE STREET LAMPS.
OVER FORTY YEARS IN USE THE WORLD OVER.
THE BEST STREET LAMPS for ALL KINDS OF GAS OR BURNERS.
This is only one of a Large Variety of Styles.
SEND FOR CATALOGUE.
THOS. T. W. MINER,
821 and 823 Eagle Avenue,
New York.

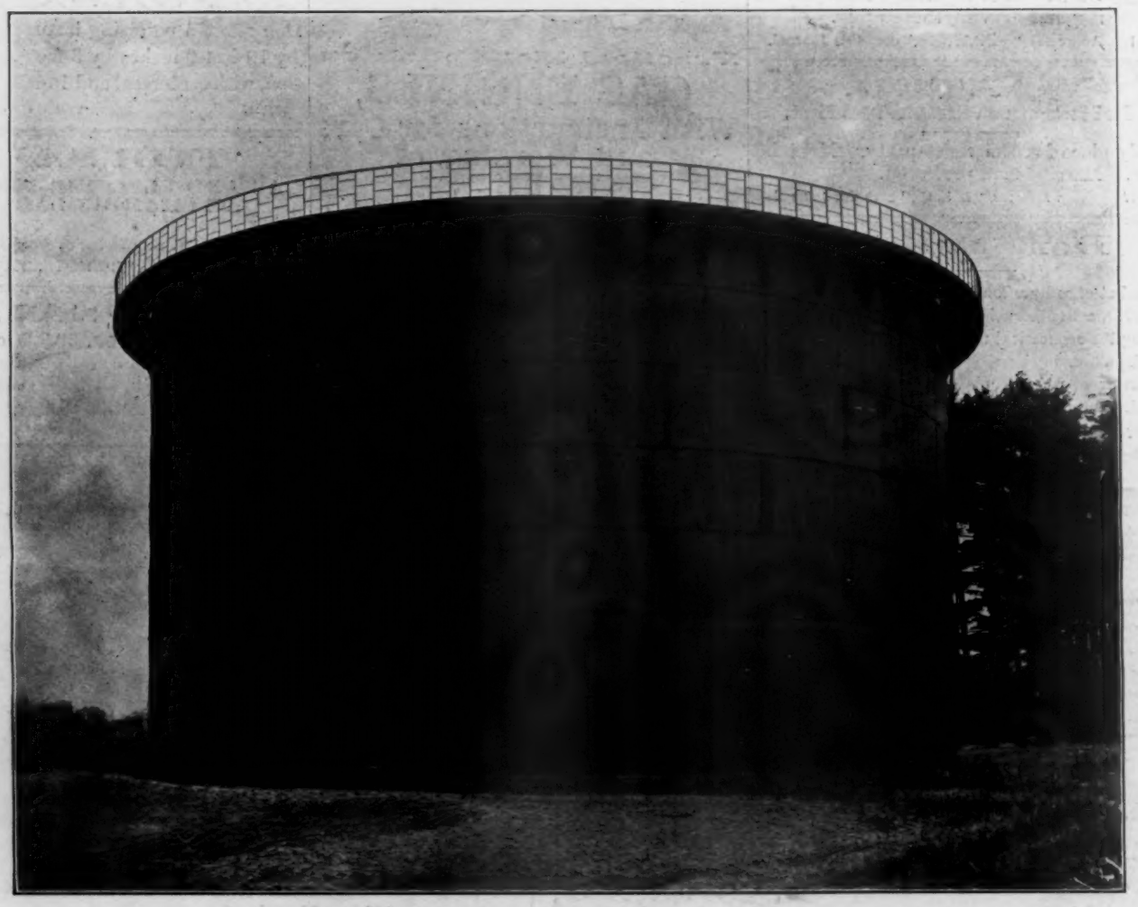

NO. 100 LAMP.

BINDERS FOR THE JOURNAL.
PRICE, $1.
FOR SALE BY
AMERICAN GAS LIGHT JOURNAL 42 Pine St., New York City.

GAS HOLDERS,

STANDPIPES—OIL TANKS—SCRUBBERS—WATER TOWERS,

DESIGNED, CONSTUCTED AND ERECTED.



Capacity, 2,380.000 gallons. SCHENECTADY, N. Y. City Water Works. Diameter 90 feet. Height, 50 feet.

ESTIMATES ON APPLICATION.

CHICAGO BRIDGE AND IRON WORKS,

MAIN OFFICE AND WORKS:
Washington Heights Station, Chicago.

BRANCH OFFICE:
30 Church St., New York.

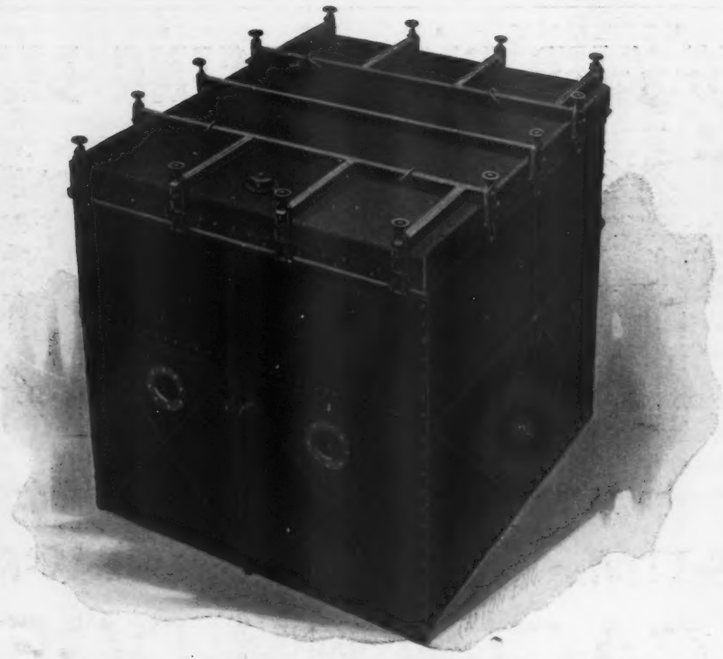
P. PLANTINGA, President W. E. STEINWEDELL, Secretary

THE GAS MACHINERY CO.,

Main Office and Shops

CLEVELAND, OHIO.

COAL AND WATER GAS APPARATUS.
EXHAUSTERS, CONDENSERS, SCRUBBERS,
TAR EXTRACTORS, WASHERS, PURIFIERS,
VALVES, CONNECTIONS,
BY PRODUCT MACHINERY,
COMPLETE GAS PLANTS.

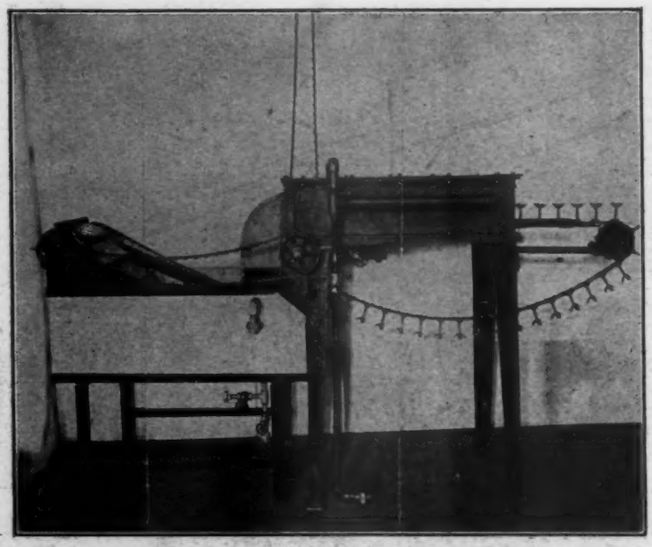


CAST IRON DUPLEX PURIFIER WITH PATENTED DRY SEAL COVER.

THE GAS MACHINERY CO.
CLEVELAND, OHIO.

GAS FURNACES and HEATING MACHINES

STATE
AMOUNT
SIZE
KIND
OF WORK
to be done in given time.



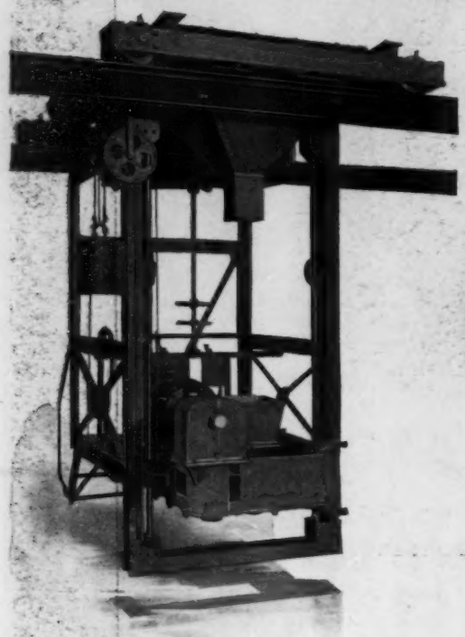
FOR
INDUSTRIAL PURPOSES.

CATALOGUE SENT ON APPLICATION.

Heating Machine for Treating Watch Case Blanks and Other Similar Work, with Cooling Bath Attachment.

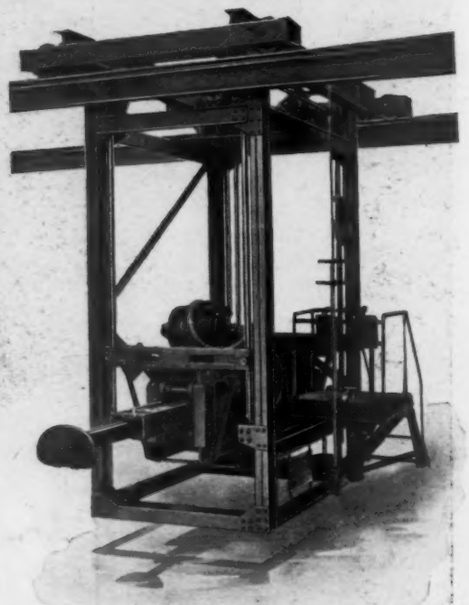
AMERICAN GAS FURNACE COMPANY,
24 John Street, New York, N. Y.

CHARGING AND DISCHARGING MACHINERY.



GET 100 CANDLE FEET BY CARBONIZING IN FULL RETORTS.

GET FULL RETORTS BY USING THESE MACHINES.



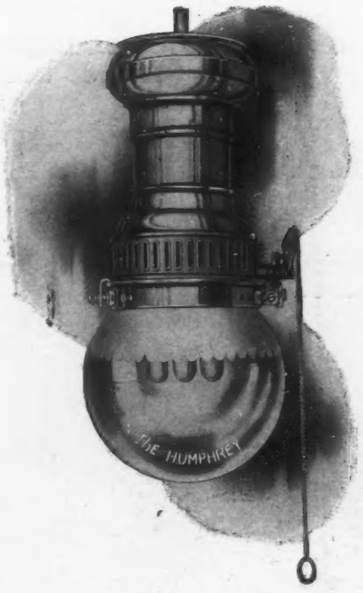
ISBELL-PORTER COMPANY,
NEWARK, N. J.

ANYBODY CAN STRING WORDS TOGETHER.

THINK IT OVER.

WE SELL MORE HUMPHREY
INVERTED GAS ARC LAMPS
THAN ALL OTHER
KINDS MADE.

WHY?



THINK IT OVER.

GENERAL GAS LIGHT COMPANY.

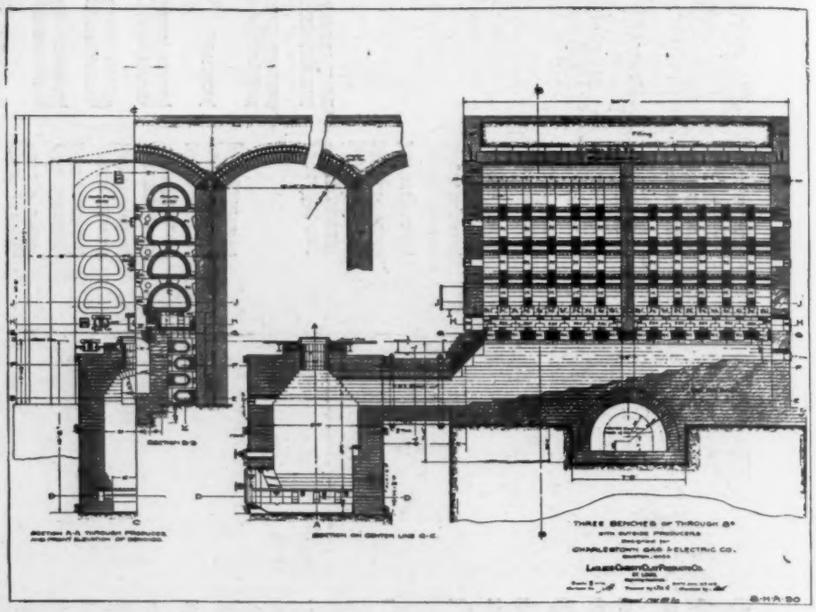
Kalamazoo. New York. San Francisco.
London, England. Bremen, Germany. Wellington, New Zealand.

WE BUILD ALL TYPES OF BENCHES.

We built three of these benches complete last season, and now have the contract for remodeling four more benches.

These benches are producing **23,000** cu. ft. of GAS PER RETORT per 24 hours with a YIELD of **5.75** cu. ft. of **17.5**-CANDLE POWER GAS—no enricher.

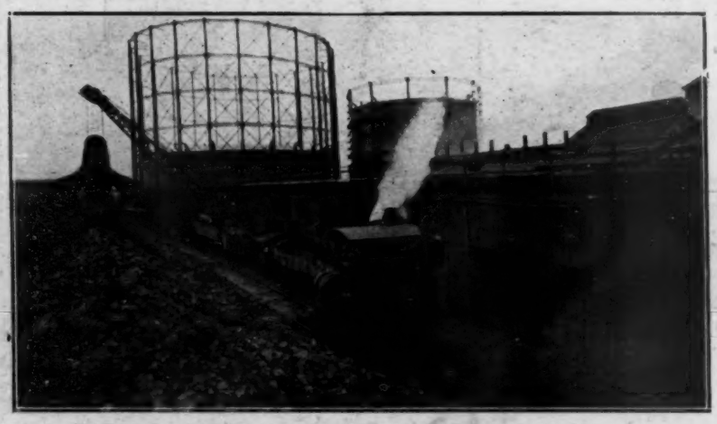
(Tested on old D, Sugg Argand Burner.)



BENCHES OF THROUGH EIGHTS, WITH RETORTS 20 FEET LONG AND OUTSIDE PRODUCERS, BUILT FOR THE CHARLESTOWN GAS AND ELECTRIC COMPANY, CHARLESTOWN, MASS.

LACLEDE-CHRISTY CLAY PRODUCTS CO.,

ST. LOUIS, MO.



"**BIG SAVING**" in your handling account using a "BROWNHOIST" LOCOMOTIVE CRANE AND GRAB BUCKET.

The illustration shows equipment in use at Kalamazoo Gas Co., Kalamazoo, Mich.

The Brown Hoisting Machinery Company.

CLEVELAND, O.

LONG DISTANCE TELEPHONE, 1503-D.

FRANK D. MOSES, President.

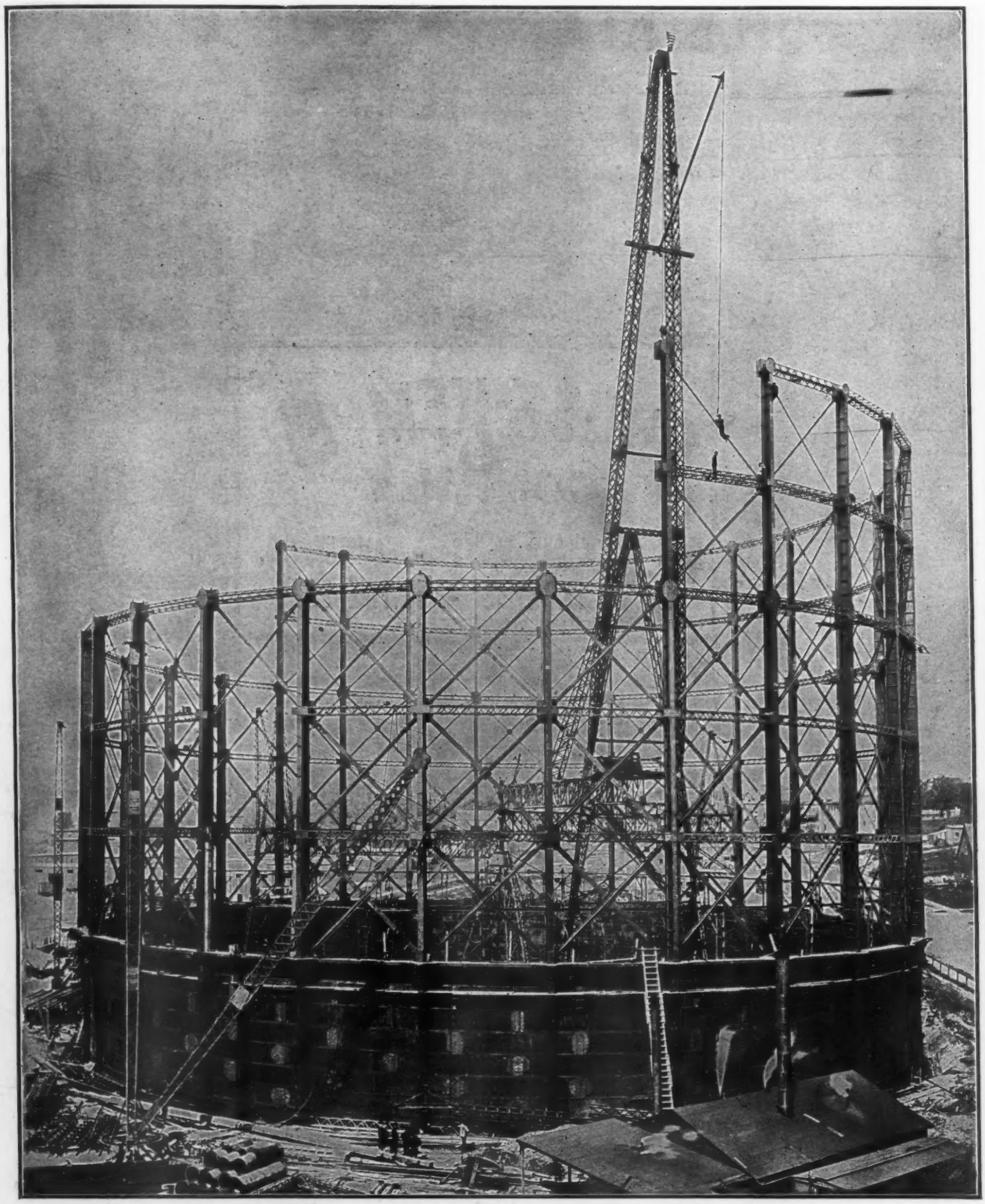
GAS ENGINEERING CO.,

MANUFACTURERS AND ERECTORS OF

COMPLETE GAS WORKS.

SPECIAL ATTENTION GIVEN TO LARGE PURIFIERS.

OFFICE AND WORKS, - - - - - - TRENTON, N. J.



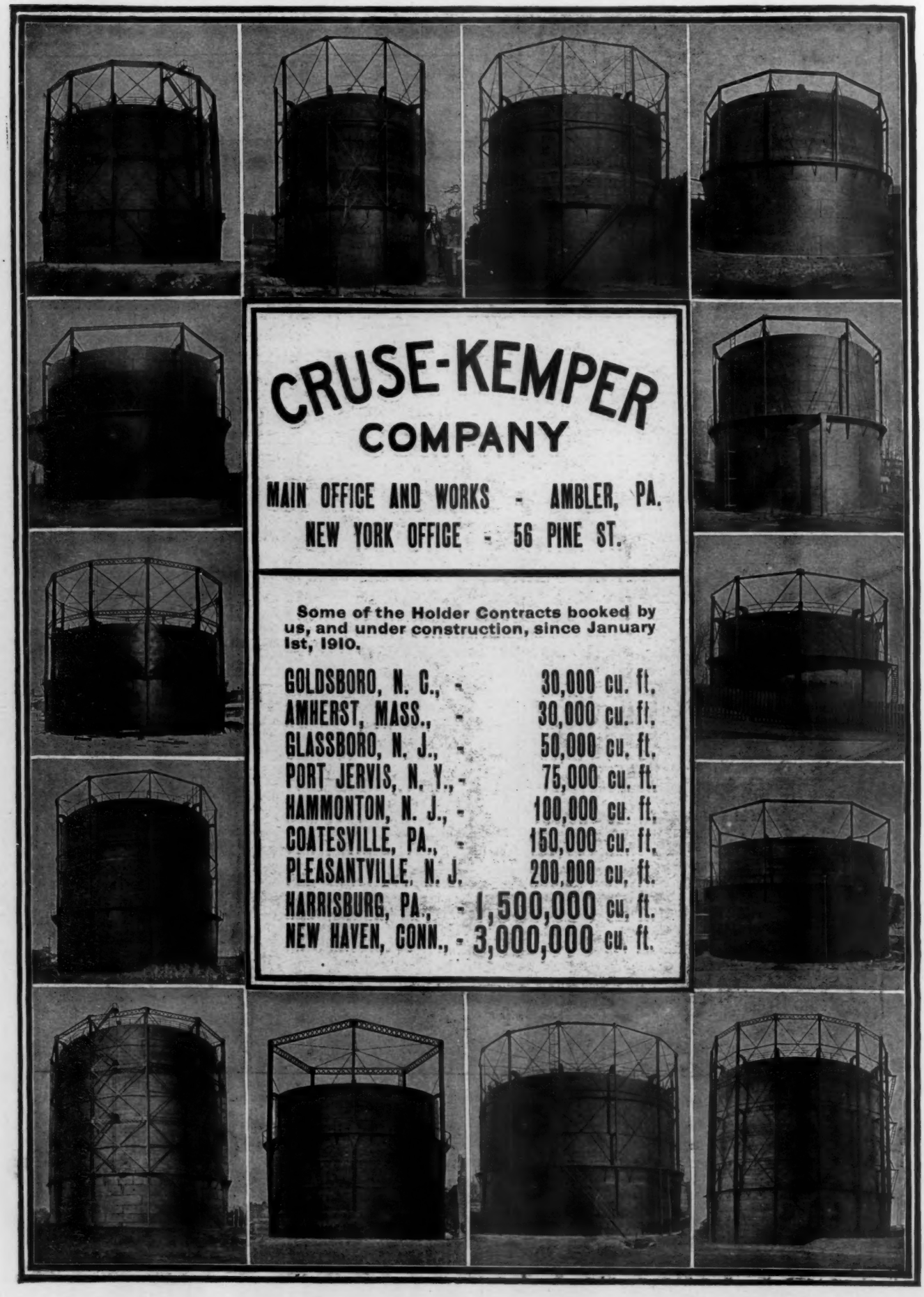
Erecting Gasholder Guide Frame with Electric Steel Traveling Derrick 225 Feet High.

RITER-CONLEY MFG. CO.,

PITTSBURGH.

PLATE AND STRUCTURAL WORK OF EVERY DESCRIPTION.

COMPLETE COAL GAS PLANTS.


CRUSE-KEMPER
COMPANY
MAIN OFFICE AND WORKS - AMBLER, PA.
NEW YORK OFFICE - 56 PINE ST.
Some of the Holder Contracts booked by us, and under construction, since January 1st, 1910.
GOLDSBORO, N. C., - 30,000 cu. ft.
AMHERST, MASS., - 30,000 cu. ft.
GLASSBORO, N. J., - 50,000 cu. ft.
PORT JERVIS, N. Y., - 75,000 cu. ft.
HAMMONTON, N. J., - 100,000 cu. ft.
COATESVILLE, PA., - 150,000 cu. ft.
PLEASANTVILLE, N. J. 200,000 cu. ft.
HARRISBURG, PA., - 1,500,000 cu. ft.
NEW HAVEN, CONN., - 3,000,000 cu. ft.

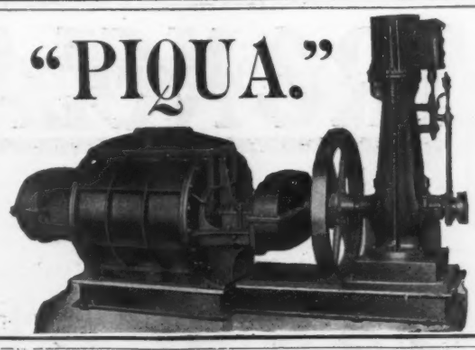
GAS EXHAUSTERS AND BLOWERS.

We have a full line of sizes for all standard pressures. The design, material and workmanship is A-1. Prompt Delivery and Reasonable Prices. WHY NOT give us YOUR requirements?

THE PIQUA BLOWER CO.,

PIQUA, OHIO.

"PIQUA."



THE

Ludlow Valve Mfg. Co.,

TROY, N. Y., U. S. A.

Double and Single Gate Valves, ¼" to 72",

—FOR—

Gas, Water, Steam, Oil, Ammonia, Etc.

HOT GAS VALVES A SPECIALTY.

Send for Catalogue.

QUINTARD IRON WORKS CO.,

Foot of Twelfth Street and East River, New York,

BENCH WORK,
CONDENSERS,
SHAVING SCRUBBERS,
CAST IRON FLANGED PIPE,
RIVETED STEEL PIPE.

FREDERICK W. FLOYD, Engineer.

ESTABLISHED 1856.

HENRY MAURER & SON,

Manufacturers of

High Grade Firebrick, Blocks, Tiles,

ETC.,

Works: Maurer, N. J. Office: 420 E. 23d St., N. Y. City.

GAS BENCH CONSTRUCTION CO.,

ST. LOUIS, MO.

COAL GAS BENCHES.

HORIZONTAL.——INCLINED.——VERTICAL.

WE HAVE ALL TYPES and SIZES IN SUCCESSFUL OPERATION.
BUILT AFTER OUR OWN DESIGNS and WITH OUR OWN MATERIALS.

WATER GAS LININGS, CHECKERBRICK.

ALL WORKMANSHIP, MATERIAL AND RESULTS GUARANTEED.

JUST PUBLISHED.

Catechism of Central Station Gas Engineering in the United States.

Compiled from the questions and answers sent out to the Practical Class, Trustees Gas Education Fund.

Section I. General Definitions. Section II. Manufacturing Materials. Section III. Manufacturing Plant---Construction and Operation. Section IV. Distribution System and Consumers' Appliances. Section V. Chemical. Section VI. Physical. Section VII. Masonry Construction. Section VIII. Miscellaneous.

6¼ INCHES BY 9 INCHES. 672 PAGES. ILLUSTRATED.

PRICE:

Cloth, $5 net, plus postage. Flexible Leather, $7 net, plus postage.

For Sale by TRUSTEES GAS EDUCATIONAL FUND, 58 William Street, New York City.

IRONCLAD

THE 100% METER

Not an uncommon name, but an uncommon cast iron, dry,

Gas Meter

Being encased in cast iron it cannot corrode—and being properly built there is practically no maintenance expense.

Either Straight or Circular Reading Registers

CATALOG 100 FREE

Pittsburg Meter Co.

Main Office and Works:
EAST PITTSBURG, PA.

New York, 149 Broadway.
Chicago, 256 Madison Street.
Kansas City, 6 West 10th Street.
Seattle, 8th and Madison Streets.
San Francisco, 149 New Montgomery Street.

Manufacturers of Gas Meters and Water Meters.

ORDER NOW

TO GET PROMPT SHIPMENT.

HUMPHREY AUTOMATIC GAS WATER HEATERS

Have the valve at the top; easy and cheap to connect; a sootless bunsen flash pilot; a galvanized, rust-proof, non-clogging burner, and many oth er things making for trouble freedom and high efficiency. ∴ ∴ ∴ ∴

GUARANTEED.

They Make Pleased Users.

HUMPHREY CO.,
Kalamazoo, Mich.

LLOYD CONSTRUCTION COMPANY

GAS APPARATUS.

DETROIT - MICHIGAN

BY USING

THE SAFEST, SIMPLEST, STRONGEST AND MOST SATISFACTORY

PREPAYMENT METERS.

TRY THEM

AND YOU WILL BE CONVINCED OF THEIR EXCELLENCE.

NEW YORK IMPROVED METER CO.,

306-310 EAST 47TH ST., NEW YORK CITY.

PACIFIC COAST REPRESENTATIVES:

NORTHWEST GAS EQUIPMENT COMPANY, PORTLAND, ORE.

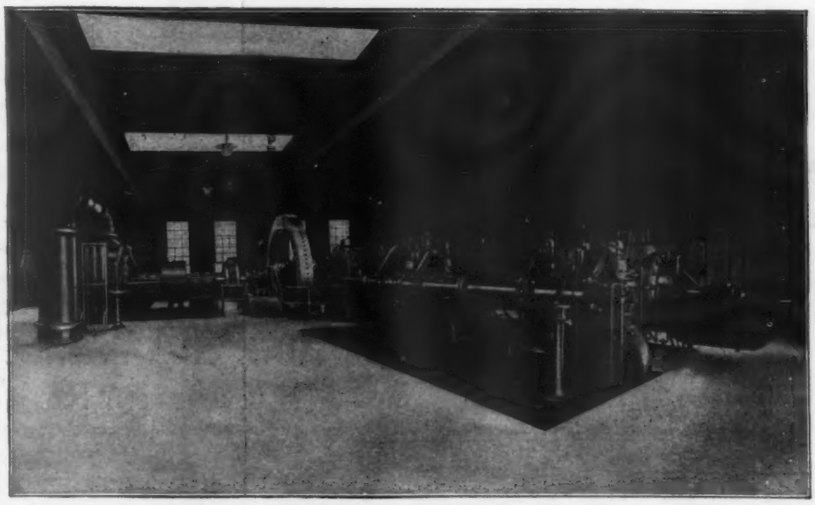
PUBLIC LIGHTING TABLES FOR MAY, 1910.

[Communicated by The American Meter Company.]

Day of Week.	Table No. 1. FOLLOWING THE MOON. Date.	Light.	Extinguish.	Day of Week.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Date.	Complete Lighting in 1 Hour.	Complete Extinguishing in 50 Minutes.
						From Time Given.	
		P.M.				P.M.	A.M.
Sun.	1	7.30	2.30 A.M.	Sun.	1	6.47	3.52
Mon.	2	7.30 L.Q.	3.10	Mon.	2	6.47	3.52
Tue.	3	7.30	3.40	Tue	3	6.47	3.52
Wed.	4	7.30	4.00	Wed.	4	6.47	3.52
Thu.	5	7.30	4.00	Thu.	5	6.47	3.52
Fri.	6	7.30	4.00	Fri.	6	6.47	3.52
Sat.	7	7.30	4.00	Sat.	7	6.57	3.42
Sun.	8	7.30 N.M.	3.50	Sun.	8	6.57	3.42
Mon.	9	7.30	3.50	Mon.	9	6.57	3.42
Tue.	10	7.30	3.50	Tue.	10	6.57	3.42
Wed.	11	7.30	3.50	Wed.	11	6.57	3.37
Thu.	12	7.30	3.50	Thu.	12	6.57	3.37
Fri.	13	11.20	3.50	Fri.	13	6.57	3.37
Sat.	14	12.00 A.M.	3.50	Sat.	14	7.07	3.27
Sun.	15	12.30 F.Q.	3.40	Sun.	15	7.07	3.27
Mon.	16	1.00	3.40	Mon.	16	7.07	3.27
Tue.	17	1.20	3.40	Tue.	17	7.07	3.27
Wed.	18	1.40	3.40	Wed.	18	7.07	3.27
Thu.	19	2.10	3.40	Thu.	19	7.07	3.27
Fri.	20	2.30	3.40	Fri.	20	7.07	3.27
Sat.	21	2.50	3.40	Sat.	21	7.12	3.22
Sun.	22	No L.	No L.	Sun.	22	7.12	3.22
Mon.	23	No L. F.M.	No L.	Mon.	23	7.12	3.22
Tue.	24	No L.	No L.	Tue.	24	7.12	3 22
Wed.	25	7.50 P.M.	10.00 P.M.	Wed.	25	7 12	3.22
Thu.	26	7.50	11.00	Thu.	26	7.12	3.22
Fri.	27	7.50	11.50	Fri.	27	7.12	3.22
Sat.	28	7.50	12.30 A.M.	Sat.	28	7.12	3.17
Sun.	29	7.50	1.10	Sun.	29	7.12	3.17
Mon.	30	7.50	1.40	Mon.	30	7.12	3.17
Tue.	31	7.50 L.Q.	2.10	Tue.	31	7.12	3.17

ROOTS' EXHAUSTERS.

A half century of experience, up-to-date engineering and shop facilities embodied in these **World Famous Gas Exhausters.**



An Installation for the Peoples Gas Light and Coke Co,, Chicago, Ill., handling 1,000,000 c.f. per hour, under six (6) pounds per square inch.

P. H. & F. M. ROOTS COMPANY,

HOME OFFICE: Connersville, Ind. NEW YORK OFFICE: 120-122 Liberty St. CHICAGO OFFICE: 1547 Marquette Bldg.

SEND FOR POCKET EDITION OF "ENGINEERS' PRACTICAL REFERENCE BOOK."

(PATENTED.)

We Don't Expect

One pattern of machine to answer the tapping needs of all gas companies—the range is too great—but we do expect that every gas company can find in the Mueller line the particular machine best suited to its needs. Each machine is made up to the Mueller standard of manufacture, has a wide range of operation and is Unconditionally Guaranteed.

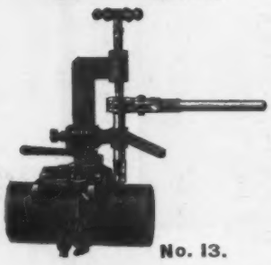
TRADE MARK
MUELLER
REGISTERED

H. MUELLER MFG. CO.

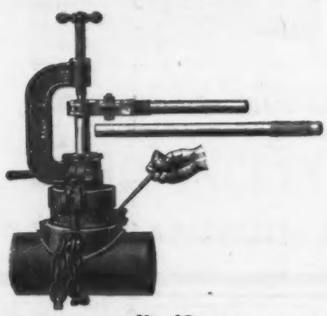
Works and General Offices,
DECATUR, ILL., U. S. A.
West Cerro Gordo St.

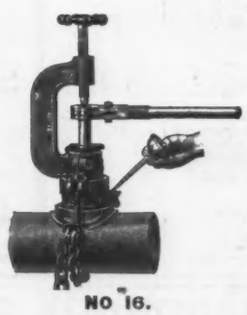
Eastern Division,
NEW YORK, N. Y., U. S. A.
254 Canal St. (cor. Lafayette).

No. 14.

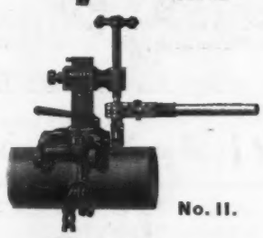

No. 13.

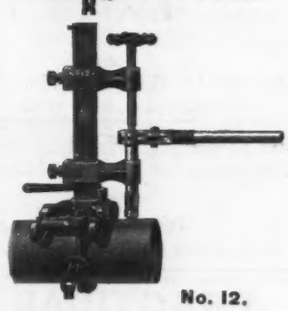
No. 17.


No. 18.


No 16.

No. 15.


No. 11.


No. 12.

BRAY BURNERS HAVE BEEN USED FOR MORE THAN FORTY YEARS.

In that time they have been recommended and used by the leading gas experts, endorsed by the U. S. Government Inspectors of Gas, as well prominent State Inspectors.

To-day the Bray is the only high-grade, absolutely reliable open flame burner on the market.

W. M. CRANE COMPANY,

16, 18 and 20 West 32d Street, New York,

SOLE AGENTS FOR GEO. BRAY & CO., LEEDS, ENGLAND.

GEORGE ORMROD, Pres. & Treas. JOHN D ORMROD, Supt.
J. G. EBERLEIN, Secretary.

EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA.

CAST IRON GAS & WATER PIPE

MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

Celebrated Lux Gas Purifying Mass

Will Save 50 Per Cent. Labor.

Used in the Gas Works of Berlin, Kiel, Frankfort, Vienna, Amsterdam, Antwerp, London, Edinburgh, Copenhagen, Madrid, Seville, Barcelona, Rio de Janeiro and others. :: :: ::

Sole Importer, F. BEHREND,
54 Front St., New York.

ELECTRIC GAS LIGHTING.

How to install electric gas igniting apparatus, including the jump spark and multiple systems for use in houses, churches, theaters, halls, schools, stores or any large building. Also, the care and selection of suitable batteries, wiring and repairs.

By H. S. NORRIE.

Price, 50 cents. Orders may be sent to

A. M. CALLENDER & CO., 42 PINE ST., N. Y. CITY.

FOR SALE,

One Set of "King's Treatise on Coal Gas."
Three volumes. Edition 1882. Price, $100.
Address,
AMERICAN GAS LIGHT JOURNAL,
42 PINE STREET, NEW YORK CITY.

Modern Machine Shop Construction, Equipment and Management, by OSCAR E. PERRIGO, M.E.

Price, $5. For Sale by

A. M. CALLENDER & CO., 42 Pine St., New York City.

COMBINATION INDICATING AND RECORDING UNITS OF WILLIAM H. BRISTOL ELECTRIC

PYROMETERS,

ESPECIALLY ADAPTED FOR GAS MANUFACTURING PLANTS.

Indicating instrument installed on Gauge Board for Gas Maker. Recording instrument installed in Superintendent's Office.

Write for Special Bulletin No. 116 explaining applications of these Pyrometers in Gas Works of many Gas Manufacturing Companies. This new bulletin also gives lists of Gas Companies using the Wm. H. Bristol Electric Pyrometers.

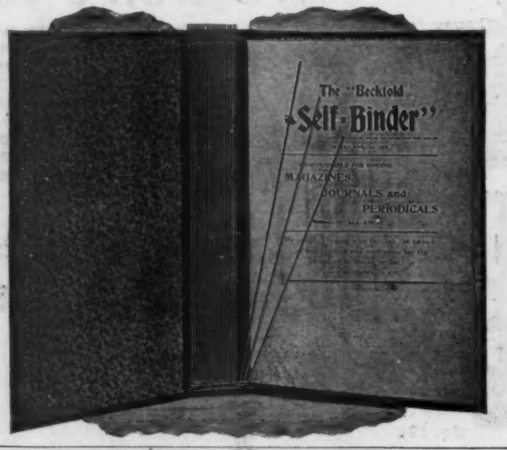
THE BRISTOL CO., WATERBURY, CONN.

BRANCH OFFICES: NEW YORK. PITTSBURG. CHICAGO

BINDER

FOR THE

JOURNAL.



PRICE, $1.

FOR SALE BY

A. M. CALLENDER & CO., - 42 Pine St., New York.

PRACTICAL HANDBOOK ON GAS ENGINES, WITH INSTRUCTIONS FOR CARE AND WORKING OF THE SAME,

By G. LIECKFELD, C.E. Translated with Permission of the Author, by GEORGE M. RICHMOND, M.E. Price, $1.

For Sale by AMERICAN GAS LIGHT JOURNAL, 42 Pine Street, New York City.

DIDIER-MARCH COMPANY,

Hudson Terminal Building,

WORKS:
Keasbey, Perth Amboy, N. J.

50 Church Street,
NEW YORK, N. Y.

DESSAU SYSTEM OF VERTICAL RETORTS,

"The Only System in Successful Operation."

U. S. Patent No. 904043.
"Process Patent for the Carbonization of Coal in Vertical Retorts."

U. S. Patent No. 801268.
"Operating Mechanism for Bottom Mouthpieces."

U. S. Patent No. 906187.
"Feeding Device."

U. S. Patent No. 899503.
"Retort House."

U. S. Patent No. 915156.
"Recuperation."

388 Benches, with 3984 Retorts in operation and under construction.

TOTAL DAILY PRODUCING CAPACITY, 60,000,000 CUBIC FEET.

First Installation in the United States of America,

PROVIDENCE, R. I., 12 BENCHES, 120 RETORTS,

Complete, with

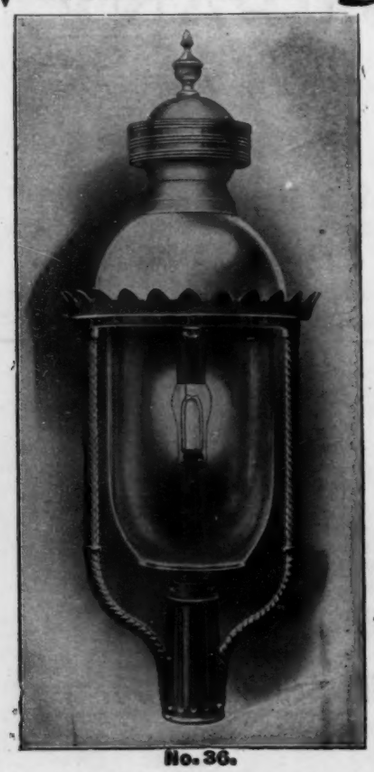
Retort House, Coal and Coke Handling Machinery and Storage Bins.

HORIZONTALS AND INCLINES OF APPROVED TYPES.

Correspondence Solicited. **FREDERICK J. MAYER, General Manager.**

NEW YORK, 318 West 42d Street. BOSTON, 820 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, 218 La Salle Street. SAN FRANCISCO, 512 Oak Street.

WELSBACH STREET LIGHTING COMPANY



No. 36.

OF AMERICA

Controls and Operates the **Welsbach System of Street Lighting,**

Which includes its specially DESIGNED and PATENTED BURNER for PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

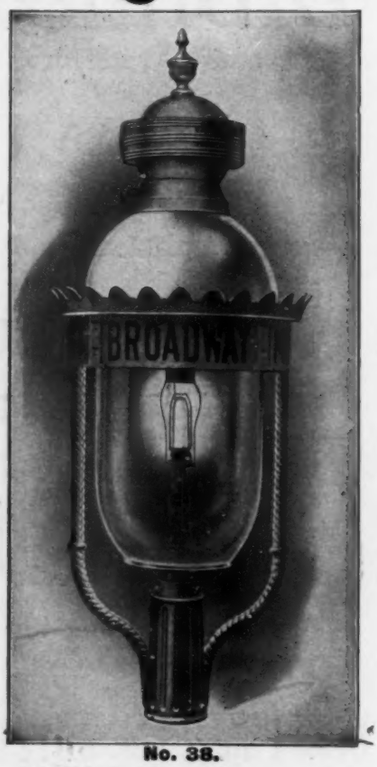
POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others Interested in Municipal and Outside Lighting.



No. 38.

REFLEXOLIERS.

No. 1031.

As an effective, efficient illuminant the Reflexolier marks a greater advance over the old methods of Gas Lighting than does the Tungsten over the Electric.

The Reflexolier is the ideal unit not only to hold present business, but best adapted to the needs of the Gas Company's new business department.

For the Reflexolier meets all the points of your competitors—and goes them several better in color value, maintenance cost, flexibility and attractive appearance.

Note:—No. 1031 *is the Standard Reflexolier*—No. 1032 *is designed to meet the demand for a more ornamental Fixture. Both finished in brushed brass*—*both furnished in* 2, 3 *and* 4 *lights.*

No. 1032.

Write for Discounts

WELSBACH COMPANY,

Gloucester, N. J. FACTORIES Columbus, O.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

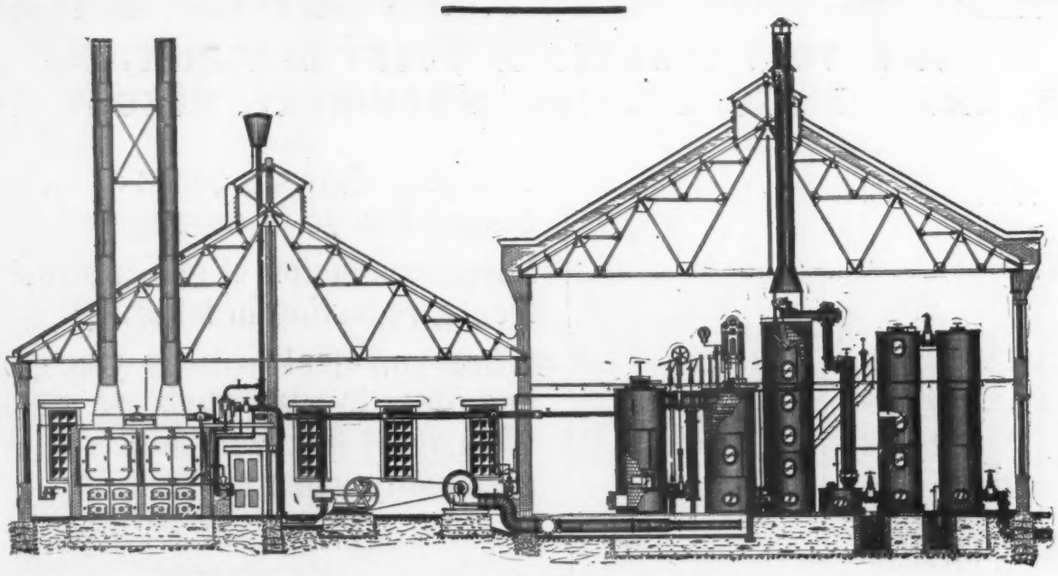
LESSEES, OPERATORS AND BUILDERS OF **GAS WORKS.**

Largest Builders of CARBURETTED WATER GAS PLANT IN AMERICA.

SOLE AMERICAN BUILDERS

OF THE

Standard Double-Superheater Lowe Water Gas Apparatus.



1909 CONTRACTS.

Belmar, N. J.	St. Albans, Vt.	Brockton, Mass.	Rosslyn, Va.
Abilene, Tex.	Jersey City, N. J.	Rockville, Conn.	Auburn, N. Y.
Pawtucket, R. I.	Everett, Mass.	Bay Shore, N. Y.	Lewiston, Me.
Middletown, Conn.	Burlington, Ia.	Sag Harbor, N. Y.	Moline, Ills.
Weatherford, Tex.	Des Moines, Ia.	Wilmington, Del.	Aurora, Ills.
New Bedford, Mass.	Pelham, N. Y.	Hammond, Ind.	Goldsboro, N. C.
Dallas, Tex.	Pleasantville, N. J.	Sumter, S. C.	Hoopeston, Ills.

TOTAL NUMBER OF SETS INSTALLED DURING YEAR 1909, ... 31
TOTAL NUMBER OF SETS INSTALLED TO JANUARY 1, 1910, ... 721
TOTAL DAILY CAPACITY TO JANUARY 1, 1910, ... 585,590,000 cu. ft.

Tar Extractors for Carburetted Water Gas
Photometrical Apparatus.
Gas Analysis Apparatus.
Recording Gauges.
Straight Standpipe System for Coal Gas Retorts.
Straight Standpipe Cleaners.
Waste Heat Boiler.
Hygrometer.
Meters for Regulating Air and Steam Supply to Water Gas Apparatus.
Emergency Kits for Persons Overcome by Gas.
Emergency Kits for Electric Shock.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas.
H. D. ABERNETHY, Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF

CLAY GAS RETORTS, FIRE CLAY TILES, FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

GEROULD'S IMPROVED RETORT CEMENT.

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use Economical and thorough in its work. Fully warranted to stick.

Price List, f.o.b. NEW CASTLE, PA.

In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD,
29 North Mill St., New Castle, Pa.

KRATER-DINAS RETORT CEMENT.

Universally accepted to be the best cement for patching and repairing retorts, making up bench work, etc. Advantages: Powdered form; only mix with water; no waste; too much mixed, apply water and use the next time; adheres very easy; does *not* fall out by decarbonization. We guarantee or take back. Many re-orders and recommendations from America, Germany, France, Belgium, etc. Write for price and testimonials.

ERNST STRASSBURGER, Sole Importer,
2630 Lincoln Avenue, Chicago, Ills.

"BEST BY TEST."

ESTABLISHED 1868.

L. N. RANCKE, V. Pres. & Mgr. E. L. RIEHA, Engineer.

BALTIMORE RETORT & FIRE BRICK COMPANY.

COAL GAS BENCHES.

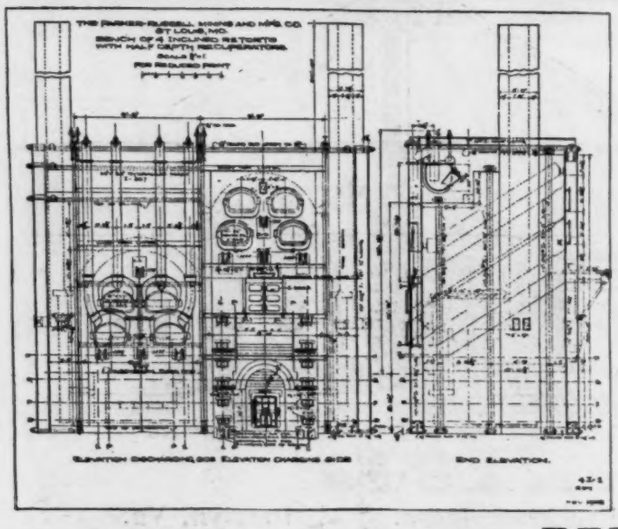
HORIZONTAL RETORTS.
INCLINED RETORTS.
VERTICAL CHAMBERS.

WALDO BROS., 102 Milk St., BOSTON, MASS.
NEW ENGLAND AGENTS.

THE PARKER-RUSSELL MINING AND MFG. CO.,

Saint Louis, Missouri. New York Office, 45 Broadway.

GAS RETORT BENCHES OF EVERY DESCRIPTION.
WATER GAS LININGS, STOKING MACHINERY, RETORT HOUSES.



This plan shows a bench of inclined fours designed to go in existing retort houses.

Large production of gas, low fuel requirements, reduction in labor.

When you deal with us you get retorts and other fireclay goods we manufacture. We do not buy from others. We know the quality when we ship.

Correspondence Solicited.

All Contracts Made as of St. Louis.

BENCHES.

VERTICAL.—We erect Vertical Benches on the continuous and intermittent systems. We are the Sole Agents of the United States and Canada west of Buffalo, Pittsburg and Toronto, for the Woodall-Duckham Continuous System. We consider this the best system on the market. There is one installation in successful operation at La Grange, Ills. High yield. Very low cost of labor.

JOHN DELL,
President and General Manager.

MISSOURI FIRE BRICK CO.,

ESTABLISHED 1882.

MANUFACTURERS OF

Gas Retorts, Bench Settings, Fire Brick, Cupola Linings, Etc.

We are the **Exclusive Agents** *for the* **Mitchell Patent Benches,** *Constructed with Half or Full Depth Furnaces, to Burn either Coal or Coke, and Arranged for Front or* **Rear Clinkering.** **The Mitchell** *is the* **Original Coal Firing Bench.** *We also Erect Plain Benches with* **One** *to* **Six Retorts.**

YOUR CORRESPONDENCE IS RESPECTFULLY SOLICITED.

City Office: *411 Olive Street, Continental Bank,* ST. LOUIS, MO.

EXPERT INSPECTION of Holders and Other Structures During Construction.
ECONOMIC DESIGN of Steel Structures, Reinforced Concrete, Masonry and Foundations.
CHAMBERS & HONE, Consulting Engineers. . . . . 1 Liberty Street, New York City.

Bronder Patent Stoking Machinery.

Three-Scoop and Three-Rake Charging and Discharging Machines are operating in New York, Newark, N. J., Philadelphia, Worcester, Mass., Mt. Vernon, N. Y., Toronto and Montreal, Canada, Detroit, Seattle, Rochester and St. Louis.

Four-Scoop and Four-Rake Charging and Discharging Machines are operating in Detroit, Mich., and Cincinnati, Ohio. These are the only machines that will draw or charge simultaneously 3 or 4 retorts (vertically) and handle from 42 to 60 retorts in from 25 to 30 minutes, lid opening and closing and filling of furnaces included.

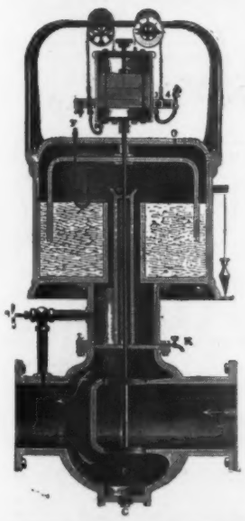
Hot Coke Conveyor, Quencher and Steam Exhauster, operating in Toronto, Canada, working in water-sealed flue, rollers being protected from heat and grit.

COAL CRUSHERS, CONVEYORS AND BINS. TURNTABLES FOR MACHINES.

Labor-Saving Machines for Handling Coal and Coke from Coal Cars to Coke Yard or Bins. Coke Screening and Measuring Plants a Specialty.

G. A. BRONDER,
Contracting Engineer and Builder,
229 BROADWAY, NEW YORK.

CONNELLY IRON SPONGE AND GOVERNOR CO.,



Automatic, Balance, High Pressure and Service Governors,
Unison Telemetric Pressure Gauge,
Iron Sponge, Purifying Material for Gas Purification, Manufacturers of Jones Jet Photometers, The National Smoke and Ammonia Helmet, Sulphur Testers, High and Low Pressure House Governors. .. ..

Wide Experience in High Pressure Installation and Extension.

PACIFIC COAST AGENT: VAN E. BRITTON, SAN FRANCISCO, CAL.

50 CHURCH ST., NEW YORK CITY.
295 WEST 22D ST., CHICAGO, ILLS.

12-Inch High Pressure Governor.

REYNOLDS' GAS REGULATOR COMPANY,

ANDERSON, IND., U. S. A.

We make all sizes for all classes of reduction,

Double and Single District Stations,

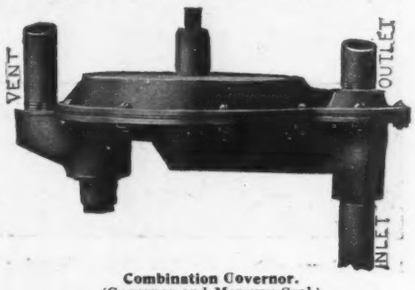
And Individual Service Governors for Reducing High Pressure.

HOLDER GOVERNORS

And Low Pressure Regulators, all of the Dry Diaphragm type.

English Agents:
THE BRYAN DONKIN CO., LTD., Chesterfield, England.

Write for Catalog.



Combination Governor.
(Governor and Mercury Seal.)

FIELD'S ANALYSIS FOR THE YEAR 1908.

PRICE, $5. FOR SALE BY
AMERICAN GAS LIGHT JOURNAL, 42 Pine St., New York City.

COAL TAR AND AMMONIA,

By GEORGE LUNGE, PH.D. Third and Enlarged Edition.
Price, $15. For Sale by
AMERICAN GAS LIGHT JOURNAL, 42 Pine St., New York City

JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

THE PERKINS COMPANY,

228 and 229 Produce Exchange, New York City.

OCEAN MINE YOUGHIOGHENY GAS COAL,
OLD KENTUCKY SHALE AND O. K. BOGHEAD.

BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

Offices:
Washington Building, New York.
Betz Building, Philadelphia.

STRICTLY High Grade. . . . .
Carefully Prepared
For Gas Making or
Heavy Steaming. .

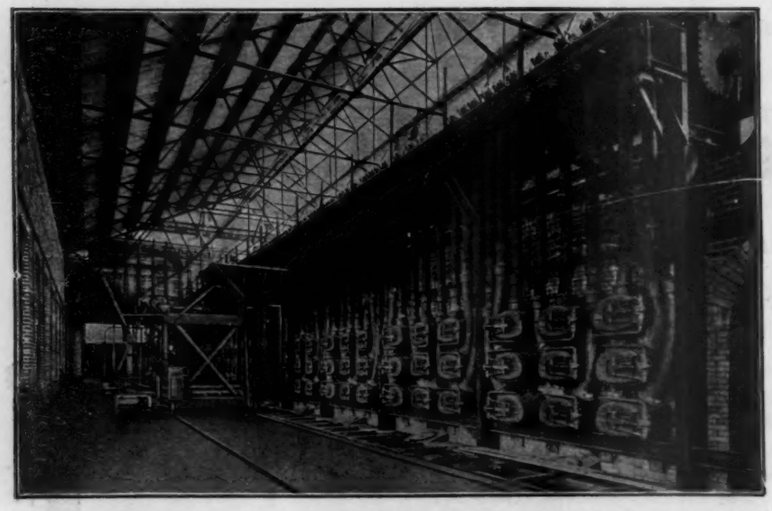
A. C. M. AZOY, General Agent, 1 Broadway, New York.

FRED BREDEL COMPANY,

FRED BREDEL, C.E., President. MILWAUKEE, WIS.

DESIGNERS AND BUILDERS OF COAL GAS WORKS AND APPARATUS.

BREDEL Recuperative Benches with Chamber Recuperator; all sizes, either Horizontal or Inclines.



Retort House with 20 Benches of 9's, Charging and Drawing Machines, Hydraulic Coke Conveyor. Erected for the Richmond City Gas Works. ALL OUR OWN SYSTEM.

Our Benches use less fuel and last longer than any other bench, without exception.

NAPHTHALENE EXTRACTOR-CONDENSERS,
NAPHTHALENE WASHERS,
TAR WASHERS,
AMMONIA WASHERS,
COOLERS,
PURIFIERS, AMMONIA STILLS,
GAS ENRICHING PLANTS,
RETORT HOUSES, STAGE FLOORS,
TURN TABLES.

BREDEL-FOULIS DISCHARGING MACHINE.

SOLE AGENTS FOR

ARROL-FOULIS CHARGING MACHINE, and
FROHNHAUSER COKE CONVEYOR.

Complete Gas Purifying Plants to use in conjunction with high percentage Sulphur Coal. Patented System in Actual Operation.

PETER YOUNG, President.
Works,
LOCKPORT STATION, PA.

ESTABLISHED 1864.

JAMES GARDNER, JR., CO.,

Successor to WILLIAM GARDNER & SON.

N. A. YOUNG, Secretary and Treasurer.
Address all communications to
JAMES GARDNER, JR., CO., Bolivar, Pa.

Fire Clay Goods for Gas Works.

KELLER ADJUSTABLE COKE CRUSHER.

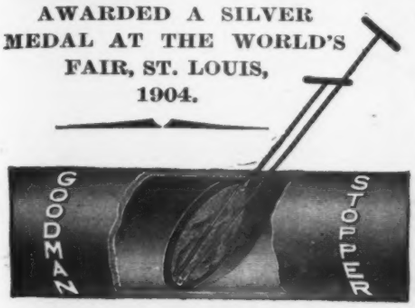
Strong, Simple, Durable. Will Crush any Size Desired.

C. M. KELLER.

Columbus, Ind.

Correspondence Solicited.

AWARDED A SILVER MEDAL AT THE WORLD'S FAIR, ST. LOUIS, 1904.



AGENTS.

Pacific Coast—VAN E. BRITTON, 269 Monadnock Building, San Francisco, Cal.

Great Britain—PARKER & LESTER, Old Kent Road, London.

MANUFACTURED BY

SAFETY GAS MAIN STOPPER CO.,

257-263 East 133d Street,
NEW YORK CITY.

PATENTS, TRADE MARKS, COPYRIGHTS.

ROYAL E. BURNHAM,

Solicitor of Patents and Counsellor in Patent Causes.

833 Bond Building, Washington, D. C.

Send for Pamphlet on Patents.

EDMUND H. McCULLOUGH, President. H. C. ADAMS, 1st Vice President. CHAS. F. GODSHALL, 2d Vice-Pres. & Treas. HENRY WHARTON, Secretary. C. B. NICHOLS, Assistant Secretary.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J., WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

GAS MAINS—SERVICE PIPES.

Their installation for High or Low Pressure is the work in which we have specialized for years. Because of our Facilities and Experience, many Gas Companies prefer to contract with us for such work, rather than to execute it themselves. It proves to be as cheap in the end. We solicit inquiries. SULLIVAN BROS.,

Telephone Connection. 11 Main St., Flushing, N. Y.

JOHN CABOT, President. GEO. D. CABOT, Secretary.

1412-1428 Adams Street, Hoboken, N. J.

PURIFIER AND SCRUBBER TRAYS.

Church's Patent Trays,

Reversible; Strongest; Most Easily Repaired.

We also Supply the Cheapest and Strongest

Reversible Bolted Trays.

Special Trays for Iron Oxide in Either Style.

GAS TAPPING MACHINES

—FOR—

Drilling and Tapping Pipe under Pressure

WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

Size of Combination Drills and Taps ¾ to 4-inch.

Machines Sent to any Gas Company for Thirty Days' Trial.

Send for Circulars.

Geo. Light,
DAYTON, O.

Standard Oil Company,

GAS NAPTHA DEPARTMENT.

GAS NAPTHA.

GAS OIL.

Correspondence Solicited.

26 Broadway, New York City.

DAVIS & FARNUM MANUFACTURING CO.,

Waltham, Mass.

GAS HOLDERS

Steel Tanks for Naptha Storage, Machinery for Coal and Water Gas Plants.

H. M. BYLLESBY & COMPANY

(INCORPORATED).

GAS ENGINEERS,

DESIGN, CONSTRUCT AND OPERATE
COMPLETE COAL, WATER AND CRUDE OIL GAS PLANTS.

EXAMINATIONS AND REPORTS.

218 LA SALLE STREET, CHICAGO.

Oklahoma City, Okla. Mobile, Ala. San Diego, Cal.

ALEX. C. HUMPHREYS, President.
EMILE GUILLAUDEU, Treasurer.
ROBT. O. LUQUEER, Secretary.
HOWARD E. WHITE, General Counsel.

EUROPEAN CORRESPONDENTS.
HUMPHREYS & GLASGOW,
LONDON. — BRUSSELS.

HUMPHREYS & GLASGOW, INC.,

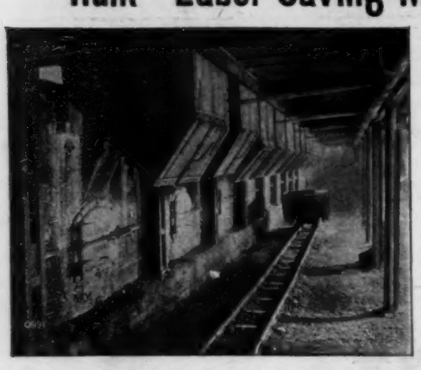
CONSULTING ENGINEERS.

ADVICE AS TO EXTENSION, MANAGEMENT AND RECONSTRUCTION OF GAS AND ELECTRIC PLANTS.

COMPLETE EXAMINATIONS MADE. ~ ~ ~ PROPERTIES PURCHASED.

CITY INVESTING BUILDING, 165 BROADWAY, NEW YORK.

"Hunt" Labor-Saving Machinery for Gas Works.



McDonald-Mann Quenching Chutes, Spokane Gas Light Co.

McDONALD-MANN QUENCHING CHUTES FOR COOLING COKE.

Where this system is in use, there is no injury to the chutes and steel work of the building, through corrosion due to the action of the gaseous vapors, unavoidable with the old method of cooling the coke on the floor.

Every Superintendent and Gas Engineer in charge of construction work should make themselves acquainted with this method. Start right away by sending for our Bulletin A-3.

Sole Manufacturing and Selling Agents,

C. W. HUNT COMPANY, Established 1872.

General Offices and Works. - - - - - - - - WEST NEW BRIGHTON, NEW YORK.
NEW YORK OFFICE, 45 BROADWAY.

HENRY I. LEA,

CONSULTING GAS ENGINEER.

DESIGN---CONSTRUCTION---MANAGEMENT
OF
GAS PLANTS
FOR
CITY SUPPLY---
POWER DEVELOPMENT---
INDUSTRIAL HEATING.

EXAMINATIONS AND REPORTS.

ROOKERY BUILDING, CHICAGO.

FIELD'S ANALYSIS FOR THE YEAR 1908

An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland; being the 40th year of publication. Compiled and arranged by JOHN W. FIELD, Sec'y and Gen. Mgr. of The Gas Light and Coke Company, London. Price, $5. For Sale by

AMERICAN GAS LIGHT JOURNAL, 42 Pine St., N. Y. City.

THE BARTLETT HAYWARD CO.
ENGINEERS & FOUNDERS.
BALTIMORE. NEW YORK.
COAL & WATER GAS PLANTS
GAS HOLDERS

PURIFIER PLANT.

CABLE ADDRESS:
WILDOLPH, NEW YORK.

WILLIAM W. RANDOLPH, M.E.,
CONSULTING ENGINEER,
FORMERLY CHIEF ENGINEER AND VICE-PRESIDENT OF
HUMPHREYS & GLASGOW, INC.
EXAMINATION AND VALUATION OF PUBLIC UTILITY AND POWER CORPORATIONS.
ADVICE AS TO CONSTRUCTION AND MANAGEMENT.

165 BROADWAY
NEW YORK CITY.

WE STOP CLINKERS.

NEW CONVERTS

TO THE ECONOMIZER ARE BEING RECEIVED AND SATISFIED USERS ARE DUPLICATING THEIR ORDERS AS FAST AS RENEWALS ARE REQUIRED.

NEW BENCHES—REFILLINGS.

Horizontals—Inclines—Verticals.

THE IMPROVED EQUIPMENT COMPANY,

MAIN OFFICES: 60 WALL STREET, NEW YORK, N. Y.

Western Agents for the Dessau System of Vertical Retorts.

SOLE LICENSEES FOR THE DOHERTY BENCH FUEL ECONOMIZER.

FIELD'S ANALYSIS
For the Year 1908.

An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland. Being the 40th Year of Publication.

PRICE, $5.

For Sale by AMERICAN GAS LIGHT JOURNAL, 42 Pine Street, New York City.

ESTABLISHED 1851.

THE STACEY MANUFACTURING COMPANY,

CINCINNATI,

Designers, Manufacturers, and Builders of

Gas Holders,

Plate and Structural Work,

Tanks of Every Description,

All Ironwork and Apparatus Required in a Gas Plant.

THE "CHOLLAR" SYSTEM OF GAS PURIFICATION.

INQUIRIES SOLICITED.

KERR MURRAY MANUFACTURING COMPANY,

Engineers and Manufacturers

APPARATUS FOR COAL GAS PLANTS,

SINGLE AND DOUBLE-LIFT GASHOLDERS
AND STEEL TANKS,

Latest Improved

ROTARY EXHAUSTERS, P. & A. TAR EXTRACTORS, AMMONIA WASHERS,

CONDENSING, SCRUBBING AND PURIFYING APPARATUS.

Street Specials and Valves.

ADDRESS:

KERR MURRAY MANUFACTURING COMPANY, {FORT WAYNE, IND.

JOHN FOWLER, President. J. SCOTT FOWLER, Vice-Pres. & Treas.

DEILY & FOWLER MFG. CO.,

39 Laurel Street, Philadelphia, Pa.

ESTABLISHED 1842. INCORPORATED 1908.

BUILDERS OF

GASHOLDERS,

Single-Lift or Telescopic,

With or Without Steel Tanks.

Oil Storage Tanks, Water Tanks, Etc.

ESTIMATES CHEERFULLY FURNISHED.

CORRESPONDENCE SOLICITED.

ASK ABOUT OUR

VICTOR BLOWERS,

For Use with Industrial Gas Appliances.

WE ALSO SOLICIT YOUR INQUIRIES FOR

GAS EXHAUSTERS,
HIGH PRESSURE GAS PUMPS,
BOOSTERS,
HUNTOON GOVERNORS,
PRESSURE REGULATORS,
BLAST VALVES,
ETC., ETC.

THE CONNERSVILLE BLOWER COMPANY,

Connersville Indiana, U. S. A.

NEW YORK OFFICE, 50 Church Street. CHICAGO OFFICE, 536 Monadnock Building.

AMERICAN GAS ENGINEERING PRACTICE,

By M. NISBET LATTA, C.E. PRICE, $4.50.

For Sale by
AMERICAN GAS LIGHT JOURNAL, - 42 Pine St., New York City.

D. McDONALD & CO.,

971-997 BROADWAY, ALBANY, N. Y.,

MANUFACTURERS OF

DRY GAS METERS, STATION METERS, PREPAYMENT METERS, METER PROVERS AND GAUGES.

THE GLOVER PREPAYMENT METER,

Simple, Strong, Satisfactory.

THE HINMAN STATION METER DRUM,

The greatest advance that has been made in 20 years in the ACCURATE and ECONOMICAL measurement of gas in large quantities. :: :: ::

NEW YORK OFFICE: 561 West 47th Street. | ALBANY OFFICE: 991 Broadway. | CHICAGO OFFICE: Jefferson and Monroe Streets.

We can meet your requirements for STATION METERS

On all capacities from 1,500 to 500,000 cu. ft. per hour.

One-half the Cost—One-tenth the Space of Old Style Wet Meters.

When in Need of Station Meters Write

ROTARY METER COMPANY,
280 Broadway, NEW YORK.

Our Literature and all information will be sent on request.

The Sprague Meter Co.

Manufacturers of

Cast Iron Gas Meters
for
Artificial or Natural Gas
Plain or Prepayment

Lower in first cost and cheaper to maintain than any meter on the market.

Write us for particulars.

The Sprague Meter Company
203 Water St., Bridgeport, Conn.

R. D. WOOD & CO.,

400 CHESTNUT ST., PHILADELPHIA,

MANUFACTURERS OF

Cast Iron Pipe.

HEAVY LOAM CASTINGS,

Dunham Specials,

Hydraulic Work,

LAMP POSTS, VALVES, ETC.,

Gas Power Plants with Producers.

BUILDERS OF

Gasholders.

Single or Multiple Lifts, with or without Metal Tanks.

PURIFIERS, CONDENSERS, SCRUBBERS, BENCH WORK.

Cutler's Patent Freezing Preventer for Holder Cups.

NATHANIEL TUFTS METER COMPANY,

455 Commercial St., Boston, Mass.

PREPAYMENT GAS METERS,

WET AND DRY GAS METERS, STATION METERS, ETC.

REPAIRING OF ALL MAKES OF METERS, AND FITTED WITH OUR PREPAYMENT ATTACHMENT.

B

METERS.

INCREASED CAPACITY.

INCREASED EFFICIENCY.

PREPAYMENT METERS, STATION METERS, METER PROVERS, ETC.

PROMPT AND CAREFUL ATTENTION TO ALL REPAIR WORK.

MARYLAND METER COMPANY,

BALTIMORE.—CHICAGO.

YOU NEED ONE OR MORE OF OUR COMPLAINT METERS.

METERS, Plain and Prepayment,

For Artificial or Natural Gas.

Repairing All Makes and Attachments Added if Desired.

SPECIAL METERS FOR ACETYLENE.

KEYSTONE METER COMPANY,

ROYERSFORD, PA.

AMERICAN METER CO.,

NEW YORK, ST. LOUIS, PHILADELPHIA, SAN FRANCISCO, CHICAGO,

Wet and Dry Gas Meters, Station Meters, Meter Provers, Photometrical Apparatus, Gauges,

PREPAYMENT METERS,

REGULAR METERS REFITTED WITH PREPAYMENT ATTACHMENTS.

HELME & McILHENNY,

Established 1848. **1339 to 1349 Cherry Street, Philadelphia, Pa.**

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

METERS REPAIRED

PREPAYMENT GAS METERS.

Our Own Patents. Strong. Simple. PROMPT ATTENTION. CORRESPONDENCE SOLICITED.

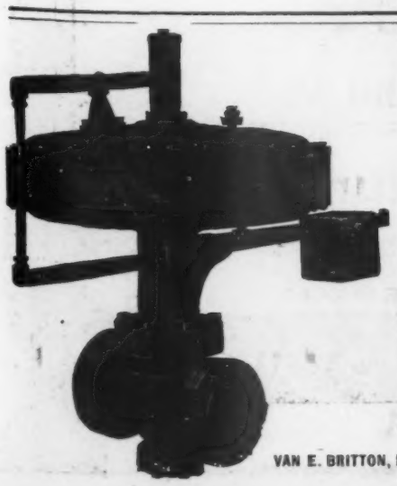
METRIC METAL COMPANY,

MAKERS OF

GAS METERS for NATURAL and ARTIFICIAL GAS.

Special Attention given to Repairing METERS of all Makes.

FACTORY AT ERIE, PA.



THE FULTON GAS PRESSURE GOVERNORS

For Artificial or Natural Gas.
For District or Individual Service.

Our Improved **Duplex Sensitive Governor** for district service will reduce high pressure gas to inches of water without variation. Absolutely safe and reliable. No complicated mechanism to get out of order. No auxiliary regulators or other devices to assist the main governor required. The most simple and perfect governor ever placed on the market. We also manufacture Holder Governors, Compressor Governors and Individual Service Governors for any inlet and outlet pressure.

More than 20 years' experience with the largest gas companies. Send for Catalog.

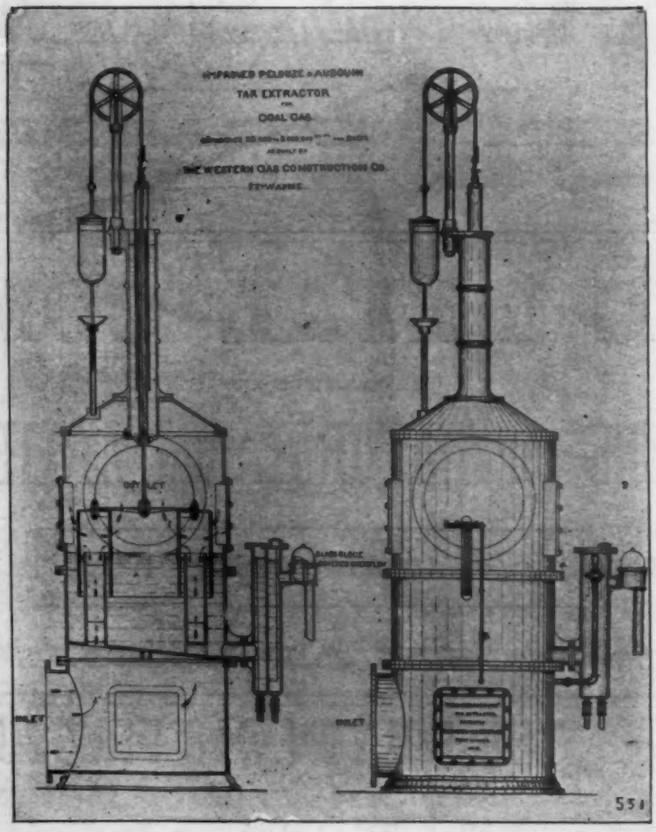
THE CHAPLIN-FULTON MFG. CO.,

VAN E. BRITTON, Pacific Coast Agent, Monadnock Bldg., San Francisco, Cal. 28-34 PENN AVE., PITTSBURGH, PA.

THE WESTERN GAS CONSTRUCTION COMPANY
WORKS AND MAIN OFFICE FORT WAYNE IND U S A
GAS ENGINEERS

EASTERN OFFICE NEW YORK CITY.
1138 Broad Exchange Building.

WESTERN OFFICE SAN FRANCISCO
580 Howard Street.



CONTRACTORS AND BUILDERS
EVERYTHING FOR A GAS PLANT